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MAY BEETLES OF THE UNITED STATES AND CANADA

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MAY BEETLES
Of the United States and Canada¹

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INTRODUCTION

Late in the nineteenth century it was realized that the species of insects belonging to the genus *Phyllophaga* were not well arranged, since the classification was based mainly on superficial characters. Although the species of this group, known as May beetles, may sometimes be recognized by external characters, the chitinous structure of the genitalia offers a more satisfactory basis for specific

identification. Smith (72)⁴ was among the first to observe the variations of the genitalia of the species, and his treatise was the first one on the classification of *Phyllophaga* in the United States in which these variations were given prominence. It was not until several decades later that other entomologists continued these studies, utilizing the genitalia as the important characters in their classification.

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² Both retired Sept. 30, 1950.

³ To the numerous collectors in the United States and Canada, who for many years have submitted specimens of *Phyllophaga* adults and have obtained distribution data on the species, grateful appreciation is expressed. Special acknowledgment is tendered to the following agencies for use of their collections: Canadian Department of Agriculture, Oklahoma Agricultural and Mechanical College, Michigan State College, Ohio Agricultural Experiment Station, Ohio State Museum, Ohio University, Iowa Wesleyan College, Purdue University which houses the famous Blatchley collection, and the Alabama State Museum which houses the H. P. Loding collection.

T. R. Chamberlin, C. L. Fluke, C. R. Neiswander, P. O. Ritcher, O. L. Cartwright, and L. W. Saylor submitted specimens and data on distribution of species. From M. W. Sanderson the writers obtained many rare forms of *Phyllophaga* from which genitalia were extracted and photographed, and also distribution data on many of the species. J. S. Wade and E. A. Chapin assisted with the literature citations and also supervised the drawings on plates 1 and 2, which were made by A. D. Cushman. J. G. Pratt made the photographs of the genitalia of the species and the venters of the males. Mary Ruth McDaniel and Charlotte B. Worley assisted with the plates.

⁴ Italic figures in parentheses refer to Literature cited, p. 97.

Among the outstanding writings in this period are those of Glasgow (22), Davis (12), Langston (32), Luginbill (42), Sim (69), Chapin (11), Travis (74), Ritcher (52), Sanderson (54, 55, 56), and Böving (4). Some miscellaneous papers containing descriptions of new species have also appeared recently, which have given further information on the group.

In all these writings, with the exception of a recent paper by Luginbill and Painter (43), the figures of the genitalia are reproductions of hand drawings. In that paper and in the present bulletin the genitalia and other figures are reproduced from actual photographs. The original process by which the genitalia and venters of the adults were photographed was developed by Pratt (47).

ECONOMIC STATUS

White grubs have been recognized as enemies of agriculture for many decades, especially in the northeastern quarter of the United States, in Texas, and in the Canadian provinces of Ontario and Quebec. The increase in damage to crops during the present century may be attributed partly to careless farm management, particularly to lack of crop rotation.

A steady rise in temperature in the spring, as is the rule in the south,

causes the adult May beetles to emerge gradually, and serious damage to trees is seldom inflicted. In the more northerly areas the weather often remains cold and wet until late spring, and then suddenly becomes dry and hot. This type of weather causes the beetles to emerge and to attack trees in hordes, with the result that sometimes the trees are completely defoliated (fig. 1).

In southern areas fields are under



FIGURE 1.—Defoliation of bur oak wood lot by May beetles in Wisconsin.

cultivation throughout the year. This constant cultivation prevents many of the grubs from maturing. Some of them are killed by mechanical means while the seed bed is being prepared, whereas others become exposed and may be killed by the hot weather or destroyed by birds or other natural enemies. Flocks of birds have frequently been seen following the plow to pick up grubs that are exposed when the soil is turned over.

Injury by larvae in the South is confined largely to the roots of young tree seedlings. However, there may be some damage to the roots of crops planted in recently plowed lands that have been in pasture or have been idle for two or more years. Corn planted on these lands may be damaged considerably the first year.

White grubs vary greatly in num-

bers in different localities in successive years. Pasture lands that have been in grass for many years build up an infestation that may completely destroy the turf. When such lands are put under cultivation, planted to corn or other grain crops, these crops may be damaged severely for several successive years. White grubs appear to do the most damage in light soil, and where rotations are irregular.

In Canada, crop losses due to the ravages of white grubs are often very severe. Thousands of acres of rough pasture in a single locality may have their feed value considerably reduced. In the North-Central States of the United States, damage by white grubs to corn, timothy, and potatoes during years of heavy infestation has amounted to several millions of dollars in a single year.

LIFE HISTORY AND HABITS

The life cycle of the various *Phyllophaga* species ranges from 2 to 4 years, depending largely on the latitude. The species from the South studied thus far have a 2-year cycle. Those in the North Central States have a 3-year cycle, except for a few species that have a 2-year cycle. In the northern part of the United States and possibly in eastern Canada the cycle may be 3 or 4 years. It may thus be seen that, if control of white grubs is to be obtained by rotation of crops, these facts must be taken into con-

sideration.

The period of activity, or the time of the year during which the beetles are observed in flight, naturally varies with the latitude and also to some extent with the altitude. Species having a wide distribution appear considerably earlier in the South than in the North.

The adults of some species have been collected from a great variety of food plants. Most of the species are angiosperm feeders, but a number of them also feed on the gymnosperms.

DISTRIBUTION

Some species of *Phyllophaga* have a very wide distribution whereas others are localized. To show the distribution, maps have been prepared for species that have been taken in three or more States or Provinces. Where a species has been found throughout a State or Province, a dot has been placed in the center of the State or Province, and where records show the species to be only in one

section of a State or Province it has been placed in the center of the area recorded. In some States extensive and intensive collections have been made and many records obtained, whereas in adjoining States little attention has been given to this group and few records are available.

The United States has been divided into the following zones for recording the host plants of the May beetles (fig. 2):

(1) Eastern, (2) Southern, (3) North Central, (4) Rocky Mountain, and (5) Pacific. In this division some consideration has been given to topography, soil conditions, and climatic factors.

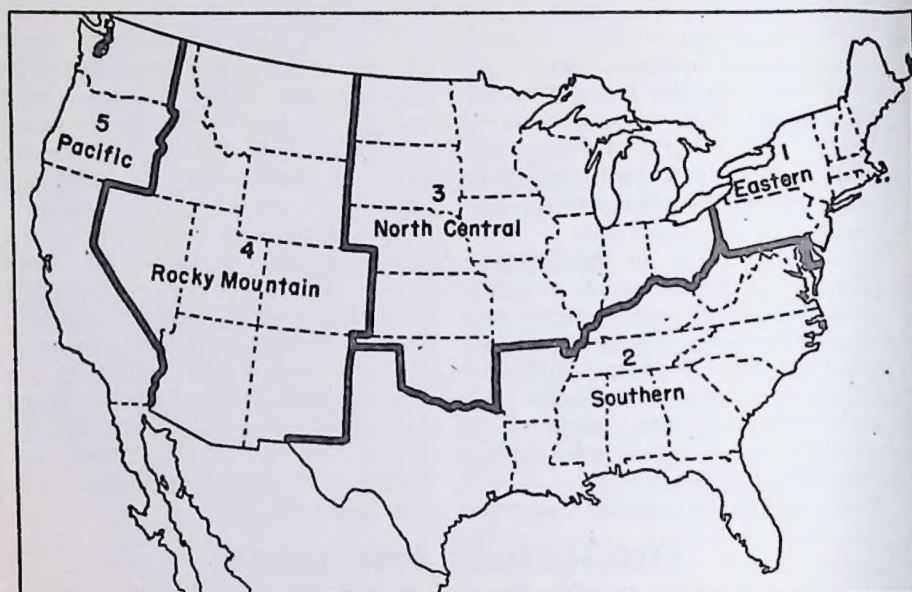


FIGURE 2.—Floral zones of the United States.

KEY TO THE SPECIES

The most obvious character in May beetles is the body covering—whether the body is covered with scales, or with hair, or is glabrous. The species have been classified according to these three categories. Other main characters used are as follows:

1. Form of clypeus, whether rounded or subtruncate, entire or emarginate.
2. Form of antenna, whether nine- or ten-segmented.
3. Form of spurs on hind tibia of male, particularly the lower spur, whether articulated (free or movable) or unarticulated (fixed); description of the lower spur including its length compared with the upper spur.
4. Form of claw, with particular reference to position of its tooth, whether basal, median, intramedian, or extramedian.
5. Form of genitalia, particularly of the male, whether its phallus is symmetrical or asymmetrical. Sometimes aedeagic male and pubic female characters are included.

In so far as possible, characters applying to both sexes were used to place a species in the key, but when these characters were insufficient, those of the male only were generally used.

CLASS I

Body above supplied with scales.

Scales small, sparse, inconspicuous.

Body oblong-oval, shiny. Length 20 mm. *aequalis*, p. 11

Scales large, elongate, conspicuous.

Body oblong-oval, piceous, opaque. Length 13-17 mm. *lancolati*, p. 12

CLASS II

Body pubescent above, the hairs either long or short, sometimes both, sometimes in definite rows on elytra but most frequently indefinitely arranged. Beetles sometimes more or less pruinose.

Hairs long, with some in definite rows on elytra.

Antennae 9-segmented. Body oblong, nearly parallel, ferruginous brown, length 17 mm. *longispina*, p. 13

Antennae 10-segmented. Body oblong, slightly broader behind, fusco-ferruginous to dark brown. Length 16.5-19 mm. *hirticula*, p. 14

Hairs of different lengths and not in rows on elytra.

Antennae 9-segmented.

Body pruinose.

Clypeus slightly reflexed, slightly emarginate. Body oblong-oval, wider behind, rufus to rufocastaneous above. Length 12.5-14.5 mm. *stohleri*, p. 14

Clypeus flat, apex truncate. Body oblong-oval, wider behind, rufocastaneous above. Length 12-13.5 mm. *rossi*, p. 15

Body not pruinose.

Entire dorsum covered with hair, longer on thorax. Body oblong-oval, nearly parallel, ferruginous brown to piceous. Length 15-18 mm. *hirsuta*, p. 15

Only the thorax hairy, elytra glabrous. Body oblong, moderately elongate, rufotestaceous or castaneous. Length 14.5-16 mm. *vilifrons*, p. 16

Antennae 10-segmented.

Body more or less pruinose.

Clypeus entire. Body oblong, slightly broader posteriorly. Length 14-15 mm. *lenis*, p. 17

Clypeus more or less emarginate.

Phallus symmetrical.

Aedeagus of the phallus moderately to heavily chitinized.

Aedeagus heavily chitinized, exerted.

Aedeagus thick set, obtuse at tip; pubic process of ♀ placoid. Body oblong-oval, scarcely broader behind, ferruginous brown. Length 15-19 mm. *rubiginosa*, p. 18

Aedeagus supplied with a long coiled spine, pubic process of ♀ wanting. Body oblong-oval, broader behind, ferruginous to dark brown. Length 13-19 mm. *vetula*, p. 18

Aedeagus moderately chitinized and not exerted; pubic process unlike. Body elongate cylindrical, brown. Length 17-18 mm. *lobata*, p. 19

Aedeagus of the phallus not chitinized but saclike.

Phallus with distal extremities moderately long extended; pubic process of ♀ with flat rounded apices. Body oblong-oval, slightly broader behind, brown. Length 21-23 mm. *aemula*, p. 20

Phallus with distal extremities long, extended; pubic process of ♀ with recurvate, truncate apices. Body oblong-oval, slightly broader behind. Length 19-23 mm. *parvidens*, p. 20

Phallus asymmetrical. Body oblong, slightly broader behind, reddish brown to brown, opaque. Length 19-23.5 mm. *ilicis*, p. 21

Body not pruinose, but sometimes iridescent.

Clypeus emarginate.

Body not iridescent.

Vestiture dense snow-white. Body oblong-oval, distinctly broader behind, brown. Length 15-18 mm. *albina*, p. 22

Vestiture either sparse or dense, short or long, grayish white or yellowish white.

Hairs on either head only or pronotum only.

Hairs on head only, pilose. Chestnut brown. Length 15-16 mm. *gravidula*, p. 23

Hairs on pronotum only. Body oblong-oval, slightly broader behind, reddish brown to chestnut. Length 17-19 mm. *paternoi*, p. 23

Hairs on both thorax and elytra.

Hairs an admixture of short and long moderately coarse hairs.

Spur of hind tibia ♂ articulated.

Phallus symmetrical, phallobase long projected caudo-ventral forming an epimere. Body rather stout, oblong-oval, ferruginous brown. Length 19 mm. *mariana*, p. 23

- Phallus symmetrical, phallobase broad but not extended into an epimere. Body oblong, brown. Length 17-20 mm. *crenulata*, p. 24
- Spur of hind tibia ♂ unarticulated. Body elongate, subparallel, castaneous to piceous. Length 17-18 mm. *pudorosa*, p. 25
- Hairs short only, fine.
- Lower spur of hind tibia ♂ articulated. Body oblong subcylindrical, brownish or ferruginous. Length 15-16 mm. *arcta*, p. 25
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur aborted, stubby. Body very elongate, cylindrical, rufotestaceous. Length 16 mm. *elongata*, p. 26
- Lower spur from one-half to two-thirds as long as upper spur.
- Lower spur obtuse, one-half as long as upper spur. Body oblong, slightly broader behind, piceous brown. Length 16.5 mm. *delata*, p. 26
- Lower spur acute, two-thirds as long as upper, fusco-rufous.
- Body oblong, slightly wider behind. Length 19.9 mm. *subtonsa*, p. 27
- Body iridescent.
- Claws with a moderate intra-median tooth. Phallus tubular. Body subcylindrical, slightly wider behind, dark reddish brown or rufopiceous. Length 17 mm. *iroides*, p. 28
- Claws with an acute basal tooth. Phallus not tubular, parameres separated.
- Body oblong, subcylindrical, slightly broader behind, reddish brown or rufopiceous. Length 19-20 mm. *submucida*, p. 28
- Clypeus entire.
- Club of antenna much longer than the stem.
- Body oblong-oval, distinctly broader behind, rufotestaceous. Length 13-16 mm. *crinita*, p. 29
- Club of antenna about as long as stem.
- Lower spur of hind tibia acute. Body oblong-elongate, slightly broader behind, yellowish testaceous. Length 11.5-15 mm. *tristis*, p. 30
- Lower spur of hind tibia truncate. Body oblong-ovate, rufotestaceous. Length 16 mm. *dentex*, p. 31

CLASS III

Body above without vestiture or pubescence, either dull or shining, sometimes pruinose or iridescent, or both.⁵

Body pruinose or sometimes iridescent.

Body pruinose.

- Clypeus entire. Body, oblong, cylindrical, testaceous to piceous, abdomen always pale. Length 15-18 mm. *latifrons*, p. 31
- Clypeus more or less emarginate.
- Lower spur of hind tibia wanting. Body robust, cylindrical, reddish brown to black. Length 14-18 mm. *prununculina*, p. 32
- Lower spur of hind tibia present, either articulated or unarticulated.
- Spur articulated, curved near the obtuse tip. Body oblong, cylindrical, rufotestaceous, head darker, elytra paler. Length 14.5-16 mm. *quercus*, p. 33
- Spur unarticulated, straight.
- Phallus symmetrical.
- Median tooth of claw, strong, acute. Body oval, slightly oblong, castaneous. Length 15 mm. *subpruinosa*, p. 33
- Median tooth of claw very weak, obtuse. Body oblong, slightly broader behind, opaque, bluish to brownish black. Length 15-17 mm. *micans*, p. 34
- Phallus asymmetrical.
- Aedeagus profusely chitinized, long exerted. Body oblong, ovate, reddish brown. Length 13.5 mm. *sociatus*, p. 35
- Aedeagus not chitinized, saclike.
- Right paramere less than one-half as large as left paramere. Body oblong, slightly broader behind, reddish brown or darker. Length 13 mm. *impar*, p. 36
- Parameres about equal in size, phallus with a hump on dorsum. Body oblong-ovate, castaneous to piceous. Length 17-18.5 mm. *pruinina*, p. 36
- Body iridescent, robust. Body ovate, robust, shining, castaneous or brown. Length 15-21 mm. *crassissima*, p. 37
- Body not pruinose or iridescent.

⁵ Occasional specimens of these species are hairy above, but this is the exception rather than the rule.

Antennae 9-segmented.

Clypeus entire.

- Apex truncate. Body oblong cylindrical, flavotestaceous. Length 7.25 mm. *juvenilis*, p. 38
- Apex rounded, sometimes slightly sinuate.
- Lower spur of hind tibia of ♂ articulated.
- Claws with teeth basal, moderate. Body moderately elongate, subdepressed, yellowish testaceous. Length 12 mm. *tusa*, p. 38
- Claws with teeth intramedian, small.
- Body oblong, slightly broader behind, rufotestaceous. Length 16.5-18 mm. *clypeata*, p. 38
- Body oblong cylindrical, castaneous to piceous. Length 11.5-13 mm. *dispar*, p. 39
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur aborted, stubby, less than one-half as long as upper spur.
- Body oblong, slightly broader behind. Length 10-11.5 mm. *clemens*, p. 40
- Lower spur not stubby, from one-half to three-fourths as long as the upper spur.
- Tooth of claw obsolete. Body oblong, elongate, parallel, cylindrical, rufotestaceous. Length 12.3 mm. *lota*, p. 40
- Tooth of claw small but not obsolete.
- Tooth median. Body oblong, nearly parallel, rather depressed, rufotestaceous. Length 15 mm. *diffinis*, p. 41
- Tooth intramedian.
- Body elongate, pale yellowish brown. Length 12-14 mm. *taxodii*, p. 42
- Body elongate, cylindrical, rufotestaceous. Length 9.5-12 mm. *debilis*, p. 42

Clypeus emarginate.

- Lower spur of hind tibia ♂ articulated.
- Spur aborted, obtuse. Body oblong, subcylindrical, rufotestaceous. Length 15 mm. *affabilis*, p. 43
- Lower spur at least two-thirds as long as the upper spur.
- Claws with tooth small, intramedian. Body oblong-oval, chestnut brown. Length 11-12 mm. *davisi*, p. 44
- Claws with teeth large, median. Phallus symmetrical, phallobase broad.
- Aedeagus a protruding complex tubular structure. Body elongate-oval, castaneous to testaceous. Length 16.5 mm. *youngi*, p. 44
- Aedeagus simple, not protruding. Body oblong, subcylindrical, rufotestaceous. Length 15 mm. *inepta*, p. 44
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur about one-half as long as the upper spur, sometimes less.
- Claws with tooth median, small. Phallus asymmetrical. Body oblong oval, rufotestaceous to brown. Length 14-17.5 mm. *implicita*, p. 45
- Claws with teeth basal, phallus symmetrical.
- Parameres conspicuously rounded in caudo-lateral region. Body oblong, rufotestaceous or darker. Length 13-15 mm. *soror*, p. 46
- Parameres conchate. Body slender, elongate cylindrical, pale yellowish testaceous. Length 10.5-13 mm. *longitarsa*, p. 47
- Lower spur about two-thirds as long as the upper spur. Phallus asymmetrical.
- Body oblong, nearly parallel, highly polished, dark brown. Length 20.5-21 mm. *nitida*, p. 47
- Body oblong, distinctly broader behind, brown to darker, moderate polish. Length 15-16 mm. *balia*, p. 48
- Antennae 10-segmented.
- Clypeus subtruncate.
- Lower spur of hind tibia ♂ articulated. Body oblong, pale rufotestaceous. Length 14 mm. *heterodoxa*, p. 49
- Lower spur of hind tibia ♂ unarticulated. Body oval, slightly oblong, rufotestaceous to brown. Length 15-19 mm. *errans*, p. 49
- Clypeus more or less emarginate.
- Apex sinuate, feebly or vaguely emarginate.
- Apex sinuate.
- Lower spur of hind tibia ♂ truncate, about half as long as the upper. Body ovate, convex, rufocastaneous to piceous. Length 18-24.5 mm. *farcta*, p. 50
- Lower spur of hind tibia ♂ acutish, about two-thirds as long as upper.

- Tooth of claw basal, or nearly so. Body broadly ovate and convex, piceous to reddish brown. Length 16.5-23 mm. *cribrosa*, p. 51
- Tooth of claw slightly intramedian. Body sub-ovate, obtuse behind, piceous. Length 12.5-14 mm. *epigoea*, p. 52
- Apex feebly emarginate, sometimes distinctly but not deeply.
- Apex distinctly emarginate.
- Lower spur of hind tibia ♂ articulated.
- Both spurs slender and acute.
- Lower spur about as long as upper. Body oblong, broader behind, brown. Length 17 mm. *elizoria*, p. 52
- Lower spur only about two-thirds as long as upper. Body elongate, subcylindrical, dark reddish brown. Length 15-16 mm. *psiloptera*, p. 52
- Lower spur truncate, hamate, upper spur wedge-shaped. Body oblong, slightly broader behind, reddish brown. Length 19-24 mm. *torta*, p. 53
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur less than one-half as long as the upper.
- Lower spur stubby, about one-sixth as long as upper. Body moderately elongate cylindrical, rufotestaceous. Length 14-19 mm. *ephilida*, p. 53
- Lower spur more than one-sixth but less than one-half as long. Body oblong, slightly broader behind, castaneous. Length 21 mm. *arkansana*, p. 55
- Lower spur from one-half to as long as the upper spur. Lower spur one-half as long. Body oblong oval, nearly parallel, rufo-castaneous to brown. Length 15-18 mm. *inversa*, p. 55
- Lower spur over one-half to nearly as long as the upper.
- Lower spur nearly as long as upper.
- Tooth of claw median. Body oblong, moderately robust, rufotestaceous to piceous. Length 15-19 mm. *congrua*, p. 56
- Tooth of claw extramedian. Body oblong, slightly oval, pale castaneous. Length 17 mm. *hirtiventris*, p. 57
- Lower spur from two-thirds to three-fourths as long as upper.
- Lower spur arcuate, truncate, upper obtuse. Body elongate, rufotestaceous to piceous. Length 22-25 mm. *perlonga*, p. 58
- Lower spur acute. Body oblong, moderately robust, castaneous. Length 19 mm. *postrema*, p. 59
- Apex of clypeus not distinctly emarginate.
- Lower spur of hind tibia ♂ articulated.
- Spur hamate. Body oblong, slightly broader behind, rufotestaceous. Length 17 mm. *hamata*, p. 59
- Spur not hamate but arcuate.
- Spurs about of equal length.
- Tooth of claw basal. Body oblong, subcylindrical, rufotestaceous. Length 14-16.5 mm. *glabricula*, p. 60
- Tooth of claw median or intramedian.
- Tooth median, stout.
- Phallobase of phallus, narrowed by a deep anterior incision. Body oblong, convex, aureous. Length 12 mm. *aurea*, p. 60
- Phallobase of phallus very broad. Body oval, slightly oblong, rufotestaceous to brown. Length 14-18 mm. *inflexa*, p. 61
- Tooth slightly intramedian, moderate. Body oblong, slightly ovate, reddish brown or pale castaneous. Length 14-16.5 mm. *fucata*, p. 61
- Lower spur about two-thirds as long as the upper.
- Tooth of claw sub-basal, small. Body moderately elongate, rufo-castaneous. Length 20.2 mm. *pusillidens*, p. 62
- Tooth of claw median or intramedian.
- Tooth of claw median.
- Phallobase very broad, parameres long extended. Body oblong, cylindrical, chestnut brown. Length 15-16.5 mm. *ignava*, p. 62
- Phallobase very narrow, parameres not long extended. Color same as *heterodoxa*. *ravida guatemalica*, p. 62
- Tooth of claw intramedian.
- Phallus tubular, parameres united forming a monodentate tip. Body variable, reddish brown. Length 12-15 mm. *rubricosa*, p. 63

- Phallus not tubular, parameres not united. Body variable, castaneous to piceous. Length 19-24 mm. *pleroma*, p. 63
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur of hind tibia as long or nearly so as upper spur.
- As long as the upper spur. Body oblong-oval, broader behind, dark brown to piceous. Length 20-22 mm. *luctuosa*, p. 63
- Nearly as long as the upper spur.
- The lower spur hooked at tip. Body oblong-oval, moderately robust, fuscous to piceous. Length 21.5 mm. *vehemens*, p. 64
- Lower spur boot-shaped. Body oblong, convex, slightly broader behind, variable, reddish brown to rufotestaceous. Length 12-17 mm. *futilis*, p. 65
- Lower spur aborted or to three-fourths as long as upper.
- Spur aborted. Body elongate, cylindrical, testaceous. Length 13.8 mm. *uniformis*, p. 66
- Spur from one third to three-fourths as long.
- Spur one-third as long. Body oblong-oval, broader behind, subdepressed, castaneous. Length 19-20 mm. *calceata*, p. 67
- Spur from about one-half to three-fourths as long.
- Spur about one-half as long.
- Tooth of claw median.
- Phallus asymmetrical. Body oblong, slightly broader behind, rufotestaceous to piceous brown. Length 15-16 mm. *praetermis*, p. 67
- Phallus symmetrical. Body moderately elongate, rufotestaceous. Length 17 mm. *schaefferi*, p. 68
- Tooth of claw intramedian. Body moderately elongate, subcylindrical, rufotestaceous. Length 14-17 mm. *forbesi*, p. 69
- Spur from two-thirds to three-fourths as long.
- Spur two-thirds as long.
- Phallus symmetrical.
- Phallobase moderately broad. Body oblong, testaceous to fuscopiceous. Length 19.5 mm. *fervida*, p. 70
- Phallobase narrow. Body usually oblong, rufocastaneous to piceous. Length 17.5-23.5 mm. *fusca*, p. 70
- Phallus asymmetrical.
- Phallobase reduced to a collar. Body oblong, castaneous or fuscous. Length 16.5-18 mm. *spreti*, p. 71
- Phallobase not collarlike but narrow.
- Mesodorsal area of phallobase ridged.
- Body oblong-oval, castaneous or brown. Length 17-20 mm. *corrosa*, p. 72
- Body oblong, reddish brown to nearly black. Length 16-20 mm. *sylvatica*, p. 73
- Mesodorsal area of phallobase flat. Body ovate, robust, rufocastaneous. Length 21-22 mm. *ulkei*, p. 73
- Spur three-fourths as long.
- Lower spur spinose, upper acutish. Body oblong, dark castaneous to piceous. Length 18-21 mm. *sodalis*, p. 74
- Lower spur obtuse, rather broad; upper narrow, acutish.
- Body oblong, slightly oval, castaneous to piceous. Length 15-19 mm. *bipartita*, p. 75
- Apex of clypeus moderately to deeply emarginate.
- Lower spur of hind tibia ♂ articulated.
- Lower spur about two-thirds as long as the upper. Body nearly parallel, light reddish yellow. Length 13-16 mm. *inopia*, p. 76
- The spurs about of equal length. Body oblong, broader behind, pale castaneous. Length 15 mm. *latidens*, p. 76
- Lower spur of hind tibia ♂ unarticulated.
- Lower spur of hind tibia much reduced or wanting. Body oblong, cylindrical, rufotestaceous. Length 13-15 mm. *glaberrima*, p. 76
- Lower spur always present and prominent.
- Lower spur from less than one-half to one-half as long as upper spur.
- Spur less than one-half as long.
- Spur short, squatty, obtuse.

- Right paramere invaginated in the lower cephalic border. Body elongate oval, subdepressed, dark brown. Length 19 mm. *incuria*, p. 77
- Right paramere not invaginated on the lower border, flat. Body oblong oval, broader behind, chestnut brown. Length 19-21 mm. *infidelis*, p. 78
- Lower spur not squatty, but narrow and narrowly obtuse. Body oblong oval, rufotestaceous to piceous. Length 16.5-18 mm. *foxii*, p. 78
- Lower spur one-half as long as upper spur.
- Phallus almost symmetrical. Body oblong-ovate, subdepressed, niger castaneous. Length 20.1 mm. *anxia*, p. 79
- Phallus asymmetrical.
1. Right paramere with a hamate process on inner lobe. Body oblong oval, sides parallel, very deep brown or piceous. Length 19-21 mm. *hornii*, p. 81
 2. Right paramere smaller than left which is conchate. Body oblong, broader behind, rufocastaneous to piceous. Length 18-23 mm. *rugosa*, p. 81
 3. Right paramere, scoop-shaped from rear, left paramere conchate. Body oblong, distinctly wider behind, light brown to deep black. Length 18.5-23 mm. *lodingi*, p. 82
 4. Right paramere bilobate. Left paramere bluntly hamate. Body oblong, oval, variable from reddish brown to almost piceous. Length 18-20 mm. *pearliae*, p. 83
 5. Right paramere bilobate. Left paramere conchate. Body oblong, scarcely broader behind, rufotestaceous to piceous. Length 15-18 mm. *fraterna*, p. 84
 6. Right paramere bilobate. Left paramere involute. Body general form oblong, medium to dark brown. Length 16-20 mm. *kentuckiana*, p. 85
 7. Right paramere spiraliform. Left paramere conchate. Body oblong-oval, dark castaneous. Length 19 mm. *ovalis*, p. 86
 8. Right paramere with a hump on the upper lateral border. Left paramere variously, elaborately sculptured. Body rather elongate, widest at the middle, chestnut brown. Length 18-20 mm. *scitula*, p. 86
 9. Right paramere narrow, involute, bilobate. Left paramere thin, conchate. Body elongate oval, sides nearly parallel, ferruginous brown to piceous. Length 21.5-23 mm. *knochii*, p. 87
- Lower spur of hind tibia more than one-half as long as the upper spur.
- Lower spur two-thirds to three-fourths as long as upper.
- Tooth of claw small, weak. Body oblong oval, rather robust, piceous. Length 21-22 mm. *barda*, p. 87
- Tooth of claw large, stout.
- Phallus asymmetrical; phallobase collar-like.
1. Right paramere bilobed. Left paramere involute. Body oblong, oval, castaneous. Length 16.3 mm. *forsteri*, p. 88
 2. Right paramere bilobed. Left conchate. Body oblong, slightly broader behind, castaneous. Length 20-23 mm. *profunda*, p. 89
 3. Right paramere involute; left paramere quite similar: fluted from the rear. Body oblong, sides almost parallel, rufocastaneous to brown. Length 16.5-21.5 mm. *marginalis*, p. 90
 4. Right paramere aborted, flattened; left paramere conchate. Body oblong, rufotestaceous, fuscous. Length 18 mm. *floridana*, p. 91
 5. Right paramere scoop-shaped; left paramere conchate. Body oblong oval, wider behind, dark brown to piceous. Length 19 mm. *curialis*, p. 92
- Phallus symmetrical. Phallobase narrow, parameres well developed. Body oblong, sub-depressed, castaneous. Length 22.5 mm. *drakii*, p. 92
- Lower spur about as long as upper.
- Phallus symmetrical; phallobase broad. Body elongate, cylindrical, pale rufotestaceous. Length 10.5-13 mm. *gracilis*, p. 93
- Phallus asymmetrical; phallobase narrow. Body robust, oblong, parallel, rufopiceous. Length 25 mm. *karlsici*, p. 94

DESCRIPTIONS OF THE SPECIES

It does not seem advisable to include complete descriptions of the species as originally published. Instead, there is given only an abbreviated description of the outstanding characters of the species. In case the student is interested in the complete description, he may obtain this from the reference cited. Where no reference is given at the end of the brief description, it is to be understood that this was made by the writers because in some instances the original description of a species is vague, sometimes in Latin, consisting of but a few words, and inadequate for this paper. In many cases the original descriptions were not used, because an extract could be prepared from later descriptions that were more thorough and complete. For example, some of the descriptions by Horn (27), although not original, were considered valid, and extracts of these descriptions have been used.

Since sexual characters are considered of prime importance in the classification of these species, most of the descriptive text pertains to the genitalia, which have been photographed. The terminology used for the parts of the male genitalia has not been consistent; therefore, the terminology of Snodgrass (73) has been adopted as being the most logical and accurate. The careful taxonomic studies of the *Phyllophaga* made by Böving (4) have been of material assistance in giving a better understanding of the terminology of the female genitalia. A description of superficial appendages, such as antennae, spurs of hind tibiae, and claws, has also been included. The ventral characters on the

sterna of the male often have specific weight, and these characters have also been noted. In several photographs the venter is shown.

In recent years there has been a tendency among entomologists to split off variables of type species of *Phyllophaga*, describing them as new species, subspecies, and varieties based on slight variations. This tendency points toward a group classification. Among individuals of a species there are often slight differences in form and structure, particularly in the ornamentation of the genitalia. These differences are particularly true of species having a very wide distribution. In this bulletin such closely allied forms have been placed together under the original species, as for instance, under *cribrosa* are placed *renodis* and *zavalana*, and under *micans*, *sacoma* and *cupuliformis* denoting a group arrangement in the classification.

The synonymy of the species of *Phyllophaga* as erected by Glasgow (22) has been used here, with a few exceptions as indicated. Many new species have been described by various authors since the studies by Glasgow were made, and they have been treated in accordance with the authors' conceptions of the classification of the species of the genus.

In the examination of a great many specimens from all parts of the United States and Canada over a period of many years, slight variations among individuals of a species were often encountered but these minor differences did not warrant the erection of new species or even varieties.

CLASS I

PHYLLOPHAGA AEQUALIS (LeConte)

Lachnosterna aequalis LeConte, 1854, Acad. Nat. Sci. Phila. Proc. 6: 440.

Lachnosterna exorata Horn, 1887, Amer. Ent. Soc. Trans. 14: 278.

Phyllophaga aequalis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Ovate, convex, piceous-black, shining; surface with sparsely placed, white, scale-like hairs. Clypeus entire concave, margin reflexed. . . . Length 0.80 inch; 20 mm. (Horn, 27, p. 218.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI unimpressed; VII moderately depressed along the posterior border. Sternum VIII unimpressed, the border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia about one-half as long as the upper spur. Both spurs slender, articulated.

Genitalia (pl. 11, nos. 1-4). Apodeme about 3 mm. long, narrowed posteriorly, with a deep depression in posterior region, the border slightly concave. Phallus symmetrical, tubular; phallobase, very broad with a shallow flutation on meson. Parameres narrow, moderately long extended, ending in a fused truncate tip. Distal opening ovate.

FEMALE unknown.

Beetles appear in April.

Known only from Texas. Rare.

PHYLLOPHAGA LANCEOLATA (Say)

Melolontha lanceolata Say, 1825, Acad. Nat. Sci. Phila. Jour. 5 (1): 194.

Lachnosterna lanceolata, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser 2): 237.

Phyllophaga lanceolata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Phyllophaga lanceolata arizonae von Bloeker, 1936, South Calif. Acad. Sci. Bul. 35 (1): 55, 56.

Phyllophaga cazieri von Bloeker, 1936, South. Calif. Acad. Sci. Bul. 35 (1): 57-58.

Phyllophaga grisiana von Bloeker, 1936, South. Calif. Acad. Sci. Bul. 35 (1): 56-57; Saylor, 1939, Wash. Acad. Sci. Jour. 29: 453-455.

Variable in form in the sexes, brownish to nearly piceous, subopaque; surface alutaceous, sparsely clothed with elongate whitish or yellowish scales. Clypeus sinuate at middle (pl. 2, fig. 20), more distinctly ♀. margin rather widely reflexed. . . Tarsal claws curved, toothed near the base, tooth small ♂, larger ♀. Length 0.52-0.68 inch; 13-17 mm. (Horn, 27, p. 216.)

Antennae 10-segmented.

MALE (pl. 5, no. 10). Mesal region of sterna IV-VI rounded with a warty process on each sternum, the one on VI much the larger; VII much depressed on meson and sides. Sternum VIII flattened on meson,

posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia articulated and over one-half as long as the upper spur. Both spurs slender and acute.

Genitalia (pl. 12, nos. 5-7). Apodeme about 5 mm. long, about 2 mm. wide in the anterior region tapering to a posterior region about half as wide; posterior region deeply transversely depressed, the border undented. Phallus symmetrical, tubular; phallobase broad. Parameres aborted, united on venter, the caudo-dorsal area thickened, the border rounded; caudo-ventral border somewhat extended beyond the caudo-dorsal border and slightly emarginate on ventro-meson of distal end.

FEMALE. Genitalia (pl. 12, no. 8). Subgenital plates about 2 mm. across, close together in posterior region, widely diverging anteriorly, depressed in front and rear. Pubic process cupuliform, fluted on the ventro-meson and with outer border of distal end rounded bent mesad.

Similar in genital structures but variable in size and in amount and length of vestiture.

Adults appear from latter part of April to middle of July.

Taken mostly in Great Plains area of United States (fig. 3) and in the province of Ontario, Canada. Common in some sections of the United States, where the grubs are injurious to field and garden crops. Since



FIGURE 3.—Distribution of *lanceolata* in the United States.

beetles are unable to fly, the spread is mainly on foot.

HOST FAMILIES. 3—Grass, pulse, amaranth, evening-primrose, *Convolvulus*, mallow, composite, sumac.

Phyllophaga squamipilosa Saylor, 59, p. 280).

Similar to *lanceolata* in genital characters (pl. 25, nos. 5 and 6.) but differs in having a subtruncate clypeus, no tubercles on ventral segments, and nonsquamous thorax and head.



FIGURE 4.—Distribution of *longispina* in the United States.

CLASS II

PHYLLOPHAGA LONGISPINA (Smith)

Lachnosterna longispina, Smith, 1889 (1888), Ent. Amer. 5: 97.

Phyllophaga longispina, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Oblong, nearly parallel, ferruginous brown, feebly shining, sparsely clothed with yellowish, erect hairs, longer and more dense on the thorax, shorter on the elytra, where they form distinct rows on the costae similar to those of *hirticula* . . . Claws arcuate, a strong acute median tooth. Length 0.68 inch; 17 mm. (Smith, 71, p. 97.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI flattened; VII with a transverse arcuate ridge caudad of which is a granulose depression. Sternum VIII slightly depressed on meson, the posterior border slightly concave. Antennal club slightly longer than stem. Lower unarticulated spur of hind tibia about as long as the upper spur, both spurs slender and acute.

Genitalia (pl. 13, nos. 1–5). Apodeme about 4 mm. long, slightly depressed along posterior border; posterior border usually straight, sometimes slightly concave. Phallus asymmetrical; phallobase narrow. Left paramere the widest, lower lateral border circularly excised forming a clawlike tip; fluted on dorsal and caudal regions somewhat irregularly due to marked depression on the

inner face. Right paramere excised in the lower lateral border also forming a clawlike tip; flutuation similar to that of left paramere but deeper and more regular, the depression on inner face not as deep.

FEMALE. Genitalia (pl. 13, no. 6). Subgenital plates about 3 mm. wide, rounded, attinent in anterior region, abruptly receding posteriorly, forming a broad ledge, its middle giving rise to pubic process. Pubic process composed of a proximal stem and two widely diverging distal stems, assuming an outline of letter Y; process sometimes bent dorsad.

This species has been confused with *hirsuta*. Female genitalia are similar but the male phallic organs are very unlike. Other distinguishing characters: *longispina* is usually ferruginous brown; *hirsuta* is smaller and blackish in color.

Constant in color, size, degree of vestiture and genital characters.

Adults appear from middle of May to July 1.

Occurs in several of the North-Central States and in Georgia of the United States (fig. 4), and in the province of Ontario, Canada.

HOST FAMILIES. 2—Beech, dogwood, ebony, heath, lily, maple, rose, walnut, witchhazel. 3—Elm.

PHYLLOPHAGA HIRTICULA (Knoch)

Melolontha hirticula Knoch, 1801, Neue Beytraege zur Insectenkunde, Theil I, p. 79.

Lachnosterna hirticula, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser 2): 254.

Phyllophaga hirticula, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5), p. 371.

Oblong, slightly broader behind, fusc ferruginous to dark brown, moderately shining, head and thorax with erect hair, elytra with lines of erect hair along the usual costae. Clypeus moderately deeply emarginate, the margin narrowly reflexed . . . Claws curved, with a strong median tooth, alike in the sexes. Length 0.65-0.75 inch; 16.5-19 mm. (Horn, 27, p. 266.)

Antennae 10-segmented.

MALE (pl. 6, no. 1). Mesal region of sterna IV-VI flattened; VII with a transverse depressed rugulose area, diagonally ridged on each side. Sternum VIII more or less depressed, the posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper spur; both spurs acute (pl. 1, fig. 5).

Genitalia (pl. 14, nos. 1-5). Apodeme rounded about 5 mm. long, posterior portion with conspicuous transverse groove on meson, the border straight. Phallus asymmetrical, the parameres widely spreading; phallobase narrow, collar-like. Left paramere, the larger of the two, shell-shaped, slightly involute on the upper caudal margin, emarginate in the cephalo-ventral region, the involution terminating in a blunt tip, sometimes acute. From the rear this paramere represents somewhat the letter J.

FEMALE. Genitalia (pl. 14, nos. 6 and 7). Subgenital plates about 3 mm. wide, usually longer than wide, widest at the proximal end, tapering distally, the distal portions somewhat separated and pointed. Pubic process somewhat flask-shaped, proximal portion broad, the sides well rounded, the ventral region deeply concave, distal portion much constricted, bent dorsad, slightly emarginate at apex.

Usually fairly constant in form, shape, and size but often denuded or almost so on dorsum. The involution of the right paramere of the male phallic organ is somewhat variable.

Adults appear from early March to latter part of July.

Rather widely distributed throughout eastern half of the United States (fig. 5). Common in some sections where the grub destroys sod lands

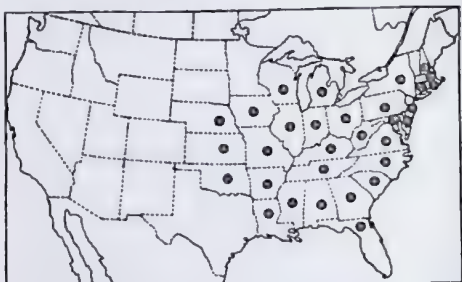


FIGURE 5.—Distribution of *hirticula* in the United States.

and farm crops. It also occurs sparingly in provinces of Ontario and Quebec, Canada.

HOST FAMILIES. 2—Beech, birch, ebony, elm, grass, honeysuckle, laurel, logania, magnolia, maple, mulberry, nightshade, pokeweed, pulse, rose, sumac, tupelo, walnut, willow. 3—Basswood, beech, birch, ebony, elm, grass, honeysuckle, laurel, olive, pulse, rose, walnut, willow, witch-hazel.

Phyllophaga hirticula Knoch var. *comosa* Davis (12, p. 337).

A variety characterized by the absence of rows of hairs on the elytra and a more compact pubic process of the female genitalia; otherwise similar to *hirticula*. Described from specimens taken in Kansas by McColloch and Hayes.

PHYLLOPHAGA STOHLERI Saylor

Phyllophaga stohleri Saylor, 1938, Ent. Soc. Wash. Proc. 40: 130.

Rufous to rufocastaneous above, head and thorax strongly shining. Elytra and part of the pygidium strongly pruinose. Head with short erect yellowish hairs. Clypeus

short, very broad . . . apex a very little reflexed and center of apex slightly shallowly emarginate, angles broadly rounded. Antennae 9-segmented . . . All tarsal claws with a small acute tooth just above the middle. Length 12.5 to 14.5 mm.; width 6.5 to 8 mm. (Saylor, 62, p. 130.)

MALE. Mesal region of sterna IV-VI slightly depressed along suture lines, VII with a papillose tumid area, behind arcuately impressed. Sternum VIII slightly depressed, the border slightly concave. Antennal club about one-half as long as the stem. Lower spur of hind tibiae slightly more than three-fourths as long as the upper spur; spurs of about equal thickness and obtuse.

Genitalia (pl. 15, nos. 5-8). Apodeme about 3 mm. long, posterior portion slightly transversely depressed, unindented, entire. Phallus asymmetrical, phallobase very broad. Left paramere somewhat aborted, folded under, the cephalo-lateral portion extended into a spiny process. Right paramere somewhat aborted, the cephalo-lateral portion extended into a spiny process, folded under, the process only about half the length as that on the left paramere; caudo-lateral portion extended into a moderately long spiny process extending ventrad; this process has no counterpart on left paramere.

FEMALE unknown.

Beetles appear during May.

Taken in California and Nevada. Rare.

PHYLLOPHAGA ROSSI 'Saylor'

Phyllophaga rossi Saylor, 1939, Wash. Acad. Sci. Jour. 29: 452.

Oblong-oval, wider behind; above rufo-castaneous and pilose; head and thorax shining, elytra slightly to moderately densely pruinose. Head with the clypeus transverse and flat, its apex truncate and angles rounded . . . Antennae 9-segmented. All claws with a sharp median tooth, base hardly dilated. Length 12-13.5 mm., width 6-7 mm. (Saylor, 63, p. 452.)

MALE. Mesal region of sterna IV-VI slightly depressed; VII unsculptured except plicate on sides. Ster-

num VIII slightly depressed, the border slightly ridged, entire. Antennal club about one-half as long as the stem. Lower spur of hind tibia articulated, about as long as the upper spur, both spurs slender and obtuse.

Genitalia (pl. 16, nos. 5 and 6). Apodeme about 3 mm. long, the posterior portion rounded not impressed, the border slightly emarginate. Phallus symmetrical; phallobase deeply emarginate on the caudal border. Parameres simple, narrow, laterally depressed, moderately long extended, fused on the venter; with two short teeth close together on the ventro-meson and two similar teeth but much farther apart on the caudo-lateral borders. Aedeagus chitinized, elaborately constructed, and bearing a cluster of setae at its terminus.

FEMALE unknown.

Beetles appear in July.

Taken only in Arizona. Rare.

PHYLLOPHAGA HIRSUTA (Knoch)

Melolontha hirsuta Knoch, 1801, Neue Beytraege zur Insectenkunde, Theil I, p. 78. *Lachnosterna hirsuta*, Horn, 1887, Amer. Ent. Soc. Trans. 14: 260.

Phyllophaga hirsuta, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, nearly parallel, ferruginous brown to piceous, feebly shining, sparsely clothed with yellow erect hairs, longer on the thorax. Clypeus emarginate, the border moderately reflexed. Claws arcuate, a strong acute median tooth. Length 0.58-0.72 inch; 15-18 mm. (Horn, 27, p. 260.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV-VI slightly flattened; VII with a curved, transverse elevation, caudad of which is a depressed somewhat granulose area. Sternum VIII somewhat depressed, the border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, and not quite so long as the upper spur. Both spurs acute.

Genitalia (pl. 17, nos. 1-5). Apodeme about 3 mm. long, somewhat flattened on dorsum in the posterior

region, its border slightly concave. Phallus asymmetrical; Phallobase reduced to narrow collar. Left paramere slightly involute on dorsum rather deeply invaginated on the lower border producing a clawlike tip pointing cephalad, inner face supplied with a conspicuous, slanting, shelflike protuberance. Right paramere more decidedly invaginated, thereby producing a more conspicuous clawlike tip, inner face with a hook curved almost at right angles and pointing laterad. From a dorso-caudal view the parameres appear channeled along inner faces.

FEMALE. Genitalia (pl. 17, no. 6). Subgenital plates about 2 mm. wide, widely spreading anteriorly, converging somewhat distad and forming a broad ledge from which the pubic process arises. Pubic process simple, distinctly Y-shaped with the two diverging tips distad; basal portion sometimes somewhat shorter than diverging legs.

Species similar to *balia* in genital structures, but can be differentiated from that species by its broader form and the fact that it usually is quite hairy on thorax and elytra. It has also been confused with *longispina*, but is easily distinguished from that species by male phallic characters.

Beetles appear from latter part of March to middle of June.

Taken mostly in the Southern States (fig. 6). It is recorded as hav-

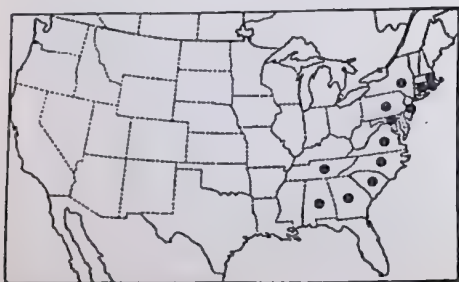


FIGURE 6.—Distribution of *hirsuta* in the United States.

ing been taken in the province of Ontario, Canada.

HOST FAMILIES. 2—Beech, calycanthus, dogwood, grass, heath, honeysuckle, maple, olive, pulse, rose, tupelo, vine, walnut. 3—Beech, elm, walnut.

PHYLLOPHAGA VILIFRONS (LeConte)

Lachnosterna vilifrons LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 255.

Lachnosterna hirticeps LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 255.

Phyllophaga vilifrons, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, moderately elongate, slightly broader behind, rufotestaceous or castaneous, shining. Clypeus deeply emarginate, the border narrowly reflexed, frontal suture deeply impressed, front with short erect hairs. Claws curved, a strong acute tooth at middle. Length 0.56–0.62 inch; 14.5–16 mm. (Horn, 27, p. 263.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI slightly flattened; VII transversely arcuately ridged, with a shallow depression caudad and rugose area on each side laterad of ridge. Sternum VIII with a shallow cupuliform depression on the meson, posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia about two-thirds as long as the upper spur, unarticulated.

Genitalia (pl. 18, nos. 1–5). Apodeme 3 mm. long, with a slight depression along the posterior concave border. Phallus asymmetrical; phallobase reduced to a collar. Left paramere flattened laterally, depressed along the lower anterior moderately reflexed border, excised on the lower lateral border, the base of the excision erose, excision produced a caudal hamate tip and a short cephalic protuberance; inner face lobular, the lobe small. Right paramere flattened laterally, markedly depressed along the anterior border, excised on the lower lateral border similar to left paramere, the excision deeper but narrower with a smooth base; caudal hamate tip similar to that on

left paramere but cephalic one much larger, wider, and longer. Inner face also lobular but the lobe much larger than that on left paramere; phallic structure has a fluted appearance from the rear.

FEMALE. Genitalia (pl. 18, no. 6). Subgenital plates about 2.5 mm. across, attingent on meson, markedly transversely depressed in the posterior portion producing a broad ledge; auriculate depression on the sides near caudal border. Pubic process composed of a short, broad flat, proximal portion and two short, broad, diverging distal portions; process has the appearance of squatty Y.

Constant in all respects except some variation in female genitalia; the process sometimes is slender and elongate.

Adults appear from middle of April to latter part of June.

Occurs in most of the area of the eastern United States (fig. 7), and has been taken at one point in the Province of Ontario, Canada. Not common.



FIGURE 7.—Distribution of *vilifrons* in the United States.

HOST FAMILIES. 2—Beech, birch, dogwood, heath, saxifrage, walnut, willow. 3—Basswood, beech, birch, dogwood, elm, laurel, rose, walnut.

PHYLLOPHAGA LENIS (Horn)

Lachnosterna lenis Horn, 1887, Amer. Ent. Soc. Trans. 14: 287.

Phyllophaga lenis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly broader posteriorly, pale rufotestaceous, elytra testaceous, surface more or less pruinose, sparsely clothed with

short erect hair, longer on the thorax and base of elytra. Clypeus entire, faintly truncate in front, acutely notched in front of the eye, concave, margin rather widely reflexed. . . . Claws feebly arcuate, tooth moderate and acute, exactly median ♀, slightly intramedian ♂. Length 0.55–0.60 inch; 14–15 mm. (Horn, 27, p. 287.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI feebly flattened; VII slightly depressed on sides, rounded on meson. Sternum VIII depressed on meson, with two dentate processes slightly separated and obtuse-pointed, posterior border entire. Antennal club less than one-half the length of the stem. Lower spur of hind tibia articulated, about half as long as the upper spur. Both spurs slender and obtuse.

Genitalia (pl. 19, nos. 1–4). Apodeme about 3 mm. long, posterior portion flattened, the border pulvinate. Phallus symmetrical; phallobase narrow. Parameres aborted, united on venter, adorned on ventro-meson with two acute teeth close together; lower caudal border broad and flattened; aedeagus highly specialized, consisting of two auriculate appendages in lower caudal region and a long spinelike accessory originating in the upper caudal section extending dorsad, recurved and terminating in a slender tip.

FEMALE. Genitalia (pl. 19, no. 5). Subgenital plates about 2 mm. across, attingent on meson, posterior region excised semimembranous, the border chitinized. Pubic process wanting.

Genitalia of female belong to the *tristis* and *crinita* type.

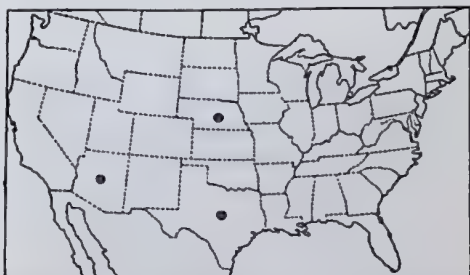


FIGURE 8.—Distribution of *lenis* in the United States.

Beetles appear in July and September.

Occurs in Arizona, Nebraska, and Texas (fig. 8). Rare.

PHYLLOPHAGA RUBIGINOSA

(LeConte)

Lachnosterna rubiginosa LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 259.

Phyllophaga rubiginosa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, scarcely broader behind, ferruginous brown, thorax moderately shining, elytra pruinose, sparsely clothed with semi-erect hair, longer on the thorax and base of elytra. Clypeus emarginate, the border narrowly reflexed. . . . Claws curved, the tooth strong, acute and median. Length 0.60-0.75 inch; 15-19 mm. (Horn, 27, p. 275.)

Antennae 10-segmented.

MALE. (pl. 4, no. 1). Mesal region of sterna IV-VI rounded, somewhat dilated; VII depressed along the posterior border, the meson granulose. Sternum VIII very narrow, posterior border straight. Antennal club about as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper spur. Both spurs slender and acute.

Genitalia (pl 13, nos. 7 and 8). Apodeme about 3 mm. long, transversely depressed in posterior portion fluted longitudinally on meson, posterior border slightly undulating. Phallus symmetrical, tubular; phallobase very broad, fluted on dorsum, angularly extended posteriorly. Parameres aborted, long extended caudad and united on venter forming a truncate or sometimes an emarginate tip; armature of aedeagus conical and protruding from the ovate distal opening.

FEMALE. Genitalia (pl. 13, no. 9). Subgenital plates about 2.5 mm. across, conchate, attingent in posterior region, diverging anteriorly, unsculptured, distal end truncate. Pubic process platelike with a rounded emargination at distal extremity producing a bilobed structure, the lobes slightly recurvate, narrowly longitudinally ridged.

Constant in genital characters but some variability in superficial characters. Some specimens reddish brown without much bloom, others very dark reddish brown and intensely pruinose. Between these two extremes are other combinations.

Female resembles *crenulata* and *parvidens* somewhat, in form of pubic process. However, in *crenulata* distal portion is very slightly emarginate, margin usually only undulating, in *parvidens* rather deeply emarginate, in *rubiginosa* emargination is rounded and in depth allocated between other two.

Adults appear from latter part of April to middle of July.

Taken at scattered points in the eastern part of the United States (fig. 9). Common in some districts.



FIGURE 9.—Distribution of *rubiginosa* in the United States.

HOST FAMILIES. 2—Elm, rose, rue.
3—Elm.

PHYLLOPHAGA VETULA (Horn)

Lachnosterna vetula Horn, 1887, Amer. Ent. Soc. Trans. 14: 274.

Phyllophaga vetula, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong oval, broader behind, color variable from ferruginous to dark brown, surface more or less pruinose distinctly so in the darker specimens, sparsely clothed with very short recumbent hair, the elytra with very long erect hair near the base and along the suture. Clypeus very feebly emarginate, the margin reflexed. . . . Length 0.50-0.75 inch; 13-19 mm. (Horn, 27, p. 274.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI feebly flattened, fluted; VII

with a short granulose elevation, behind which the segment is decidedly depressed. Sternum VIII deeply depressed in the middle, raised and two-toothed on the cephalic border, the teeth broadly rounded; posterior border slightly emarginate. Antennal club less than one-half the length of the stem. The spurs of the hind tibia articulated, almost of equal length, narrow, and somewhat obtuse.

Genitalia (pl. 20, no. 10; pl. 49, nos. 10-12). Apodeme about 3 mm. long, posterior portion unevenly depressed, border slightly undulating. Phallus symmetrical; phallobase very narrow. Parameres aborted, fused on venter, somewhat conchate, slightly depressed along the anterior border, with two sharp-pointed teeth close together on the cephalic border and two shorter and blunt remote teeth on the caudal border of the distal extremity. Aedeagus highly adorned with chitinated accessories, particularly a conspicuous, stout, glossy, black, coiled spine, tip pointing sinistrad.

FEMALE. Genitalia (pl. 20, no. 9). Subgenital plates about 3 mm. across, attingent on meson, divergent anteriorly, incised in the truncate distal region, the caudal and lateral borders heavily chitinated. Pubic process wanting.

Constant in genital characters, sometimes variable superficially in degree of vestiture and pruinosity.



FIGURE 10.—Distribution of *vetula* in the United States.

Beetles appear from June to August.

Occurs in the Southwestern States (fig. 10). Not common.

PHYLLOPHAGA LOBATA (Fall)

Lachnosterna lobata Fall, 1908, Ent. News 19: 163.

Phyllophaga lobata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Elongate cylindrical, not or scarcely broader behind, brown, elytra sparsely clothed with short erect hairs, few if any of which exceed in length one-fourth the width of the scutellum, and which are arranged for the most part along the costae. Clypeus with a moderate cuspiform emargination, the border moderately reflexed. . . Claws with an acute median tooth. Length 17-18 mm., width 6.75-7 mm. (Fall, 14, pp. 163-164.)

Antennae 10-segmented.

MALE. Mesal region of sternum IV-VI flattened, with a rounded prominence on either side; VII with a small carina on meson, a prominence on either side and transversely depressed in the posterior region. Sternum VIII rounded on meson, the posterior border slightly convex, entire. Antennal club somewhat less than one-half as long as the stem. Lower spur of hind tibia reduced to an unarticulated stubby prominence. Upper spur very long, slender and acute.

Genitalia (pl. 21, nos. 1-4). Apodeme 3 mm. long, the posterior region depressed on meson, the border deeply excised. Phallus symmetrical; phallobase very broad rounded. Parameres rounded laterally, attenuate posteriorly to a fused obtuse tip.

FEMALE. Genitalia (pl. 21, no. 5). Subgenital plates about 2 mm. across, diverging anteriorly and posteriorly, attingent in the middle, depressed in the posterior region to accommodate the process. Pubic process urnlike, longitudinally depressed, slightly emarginate in the middle of the distal end.

Adults appear in July and August. Taken only in Arizona. Rare.

PHYLLOPHAGA AEMULA (Horn)

Lachnosterna aemula Horn, 1887, Amer. Ent. Soc. Trans. 14: 271.

Phyllophaga aemula, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong oval, slightly broader behind, facies rather robust, brown, surface distinctly pruinose, clothed with fine, short, recumbent pubescence. Clypeus emarginate, the border narrowly reflexed . . . Claws with a large acute tooth at middle, slightly smaller and near the base in the female. Length 0.82-0.90 inch; 21-23 mm. (Horn, 27, p. 271.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI feebly depressed; VII with a granulose depression, on either side of which is a tuberosity. Sternum VIII slightly depressed, narrow, posterior border straight, entire. Antennal club about two-thirds as long as the stem. Lower articulated spur of hind tibia about two-thirds as long as the upper. Both spurs broad and attenuate.

Genitalia (pl. 22, nos. 1-3. Apodeme about 3 mm. long, slightly depressed in the posterior region, the border slightly emarginate on meson. Phallus symmetrical, about at right angles to apodeme; phallobase broad. Parameres aborted, somewhat extended distad in the lower caudal region and fused, producing a tubular structure sharply emarginate at lower caudal border; distal opening circular.

FEMALE Genitalia (pl. 22, no. 4). Subgenital plates about 2.5 mm. across, conchate, attinent at the middle, diverging markedly anteriorly, less so posteriorly, distal extremities obtusely angular, unsculptured. Pubic process composed of a broad plate emarginate in the middle of the distal end, forming a broadly bilobed apex, sutured; ridged longitudinally from the base of the emargination to the base of the process, depressed on either side of ridge; lateral margins narrowly excised from the base to within a short distance of the distal end of plate.

Constant in most superficial characters but slight variations in color, from light reddish brown to dark reddish brown. Constant in genital characters.

Beetles appear from May to July.

Taken mainly at points along Atlantic and Gulf Coasts (fig. 11). Not abundant.

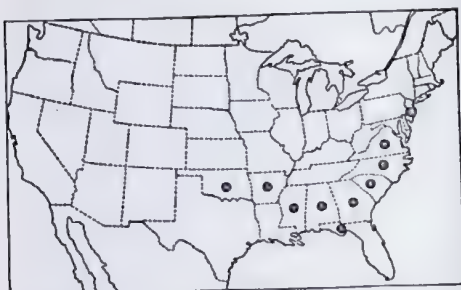


FIGURE 11.—Distribution of *aemula* in the United States.

HOST FAMILIES. 2—Beech, ebony, pine, rose willow.

PHYLLOPHAGA PARVIDENS (LeConte)

Lachnosterna parvidens LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 259.

Phyllophaga parvidens, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, slightly broader behind, moderately robust, brown, sometimes more or less ferruginous, subopaque, very slightly pruinose, sparsely pubescent, with larger erect hairs on the head, thorax and base of elytra. Clypeus feebly emarginate, the border narrowly reflexed . . . Length 0.75-0.90 inch; 19-23 mm. (Horn, 27, p. 275.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI slightly flattened; VII slightly flattened and densely granulose. Sternum VIII slightly depressed along anterior border and granulose (pl. 10, fig. 8). Antennal club about as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper spur. Both spurs slender and acute.

Genitalia (pl. 12, nos. 1-3). Apodeme 5 mm. long, markedly transversely depressed in the posterior portion, the border markedly con-

cave. Phallus symmetrical; phallobase broad, deeply and broadly excised posteriorly. Parameres well developed, rounded laterally, excised on the caudal border and terminating in rather long extended, rounded, attingent apices; distal opening somewhat ovate.

FEMALE. Genitalia (pl. 12, no. 4). Subgenital plates about 4 mm. across, attingent on dorsum near distal extremity, widely diverging anteriorly, lateral sides rounded, unsculptured, somewhat truncate at distal end. Pubic process conchate composed of a broad plate, longitudinally ridged on meson, markedly emarginate and bilobed at distal extremity, the lobes truncate and recurvate.

Constant in genitalic structures but varies somewhat superficially in degree of pruinosity.

Adults active from early March to middle of June.

Taken in the Southeastern States (fig. 12). Not common.

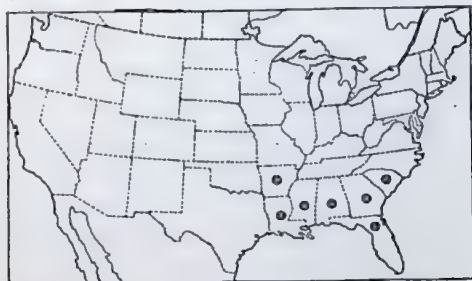


FIGURE 12.—Distribution of *parvidens* in the United States.

HOST FAMILIES. 2—Beech, pine, rose, walnut.

Phyllophaga parvidens var. *hysteroptyga* Davis (12, p. 336).

Described from several males taken in Texas and Florida. Only character that distinguishes this variety from the true *parvidens* is its much smaller size. Genitalia are similar.

PHYLLOPHAGA ILICIS (Knoch)

Melolontha ilicis Knoch, 1801, Neue Beytraege zur Insectenkunde, Theil I, p. 75.
Lachnosterna ilicis LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 253.
Melolontha porcina Hentz, 1830, Amer. Phil. Soc. Trans. 3 (n. s.): 256.
Ancylonycha fimbriata Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 326.
Lachnosterna ciliata LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 253.
Phyllophaga ilicis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.
Phyllophaga jonesi Sanderson, 1939, Kans. Ent. Soc. Jour. 12:5.

Oblong, slightly broader behind, brown, more or less opaque, elytra pruinose, surface sparsely clothed with short, recumbent hair, equal in length. Clypeus rather deeply emarginate, the border not widely reflexed. . . . Claws curved, tooth strong and median. Length 0.75–0.92 inch; 19–23.5 mm. (Horn, 27, p. 268.)

Antennae 10-segmented.

MALE. (pl. 3, no. 2). Mesal region of sterna IV–VI slightly flattened; VII with a marked pillobose depression on each side of which is a sharply defined oblique ridge. Sternum VIII also slightly depressed on meson, the border undulating. Antennal club about as long as the stern. Lower spur of hind tibia unarticulated, obtuse and about one-half as long as the more slender acute upper spur.

Genitalia (pl. 23, nos. 7–11). Apodeme about 5 mm. long with a transverse lunate depression just cephalad of the straight but somewhat raised posterior border. Phallus asymmetrical with parameres widely spreading; phallobase reduced to a collar. Left paramere conchate with a lunate incision on the dorsum. Upper lateral portion of paramere is broad, but gradually narrows ventrally and together with the invagination of the lower anterior border forms a blunt tip. Inner face near lunate incision sometimes bears a sharp narrow transverse ridge. Right paramere much narrower than the left, decidedly involute on the venter forming an inner lobe almost as wide or wider than the other one, somewhat scoop-shaped from the rear, tip broad and bent somewhat cephalad.

FEMALE. Genitalia (pl. 23, no. 12). Subgenital plates about 2 mm.

long, about as wide as long, attinent on meson, deeply depressed on the suture line; inner distal points on meson pointed; laterad of each point are well-defined auricular concavities. Pubic process bottle-shaped, the proximal portion the widest and deeply concave on the venter, sides rounded and straight, becoming much constricted distad, ending in a flattened somewhat notched tip.

Fairly constant in form, color, vestiture and genital characters except pubic process of female varies considerably in shape.

Beetles appear from first part of April to middle of July.

Distributed generally throughout eastern half of United States (fig. 13). Not common in open pasture but more common in forest areas. Taken in limited numbers at several points in the province of Ontario, Canada.

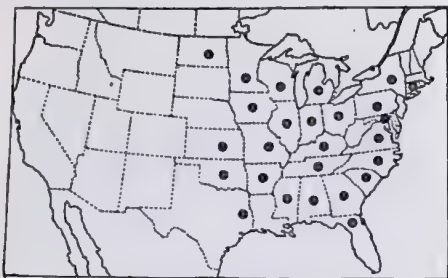


FIGURE 13.—Distribution of *ilicis* in the United States.

HOST FAMILIES. 2—Basswood, beech, calycanthus, dogwood, ebony, elm, heath, laurel, magnolia, maple, mulberry, olive, planetree, pulse, rose, vine, walnut, willow. 3—Basswood, beech, dogwood, elm, laurel, logania, rose, walnut, witchhazel. Canada—Witchhazel.

PHYLLOPHAGA ALBINA (Burmeister)

Ancylonycha albina Burmeister, 1855, Handb. der. Ent., Bd. 4, Abt. 2, p. 328.

Lachnosterna albina, Horn, 1887, Amer. Ent. Soc. Trans. 14: 273.

Phyllophaga albina, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong oval, distinctly broader behind, brown, moderately shining, surface rather densely clothed with white hairs. Clypeus emarginate, the border narrowly reflexed . . . Claws with a moderately large, acute, median tooth. Length 0.60–0.70 inch; 15–18 mm. (Horn, 27, p. 273.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI slightly flattened; VII with a granulose area and a short low ridge on either side. Sternum VIII narrow, rugulose, the posterior border straight, entire. Antennal club somewhat shorter than stem. Lower spur of hind tibia almost as long as the upper spur, articulated. Both spurs narrow and acute.

Genitalia (pl. 24, nos. 1–4). Apodeme about 2.5 mm. long. The posterior portion rounded on meson, slightly depressed on sides, the border slightly convex. Phallus symmetrical; phallobase, broad. Parameres aborted, fused on venter forming a tubular structure, somewhat emarginate at lower distal extremity; distal opening ovoid.

FEMALE. Posterior border of VIII feebly concave.

Genitalia (pl. 24, no. 5). Subgenital plates about 2 mm. wide, unsculptured, concealing the greater portion of the process above. Pubic process a triangular plate, depressed on ventro-meson, distal border broadly but not deeply emarginate, the outer edges somewhat erose and deflected.

Only a few specimens seen; these show constancy in characters including genitalia. Species easily recognized by its profuse covering of white appressed hairs. Pubic process of female genitalia resembles that of *crenulata*, but emargination at distal extremity is deeper than in that species. The male phallic organ is more robust and more deeply emarginate in *albina* than in *crenulata*.

Beetles active from May to July.

Taken only in Indiana and Ohio. Rare.

PHYLLOPHAGA GRAVIDULA Moser

Phyllophaga gravidula Moser, 1921, Deut. Ent. Ztschr., p. 247.

Phyllophaga perita Sanderson, 1937, Kans. Ent. Soc. Jour. 10: 14.

Chestnut brown, shining, head and prothorax dark. Head, sparsely punctate, pilose with hairs erect; clypeus rounded, emarginate in the middle; antennae reddish-yellow, 10-segmented. Club in both sexes, small, ovate. Length 15-16 mm. (Moser, 46, p. 247.)

MALE. Mesal region of sterna IV-VII rounded, somewhat tumid; VIII depressed, papillose with a slight emargination on the rounded slightly ridged posterior border. Antennal club somewhat less than one-half as long as the stem. Lower spur of hind tibiae articulated, about three-fourths as long as the upper spur; both spurs acute and about equal width.

Genitalia (pl. 25, nos. 1-3). Apodeme about 4 mm. long, the posterior portion slightly depressed on meson with a tumid area on either side; posterior border very deeply but roundly excised. Phallus symmetrical; phallobase narrow. Parameres much aborted, narrow, extending laterad and ventrad ending in obtuse or rounded attingent apices; caudad of terminus of each paramere there is an oarlike attingent extension somewhat shielding a portion of the aedeagus above. Aedeagus stout, the outer portion slender and attenuate.

FEMALE. Posterior border of sternum VII convex and slightly ridged.

Genitalia (pl. 25, no. 4). Subgenital plates about 2 mm. across, unsculptured, distal portions truncate. Pubic process, placoid, eroded, and slightly emarginate in the middle of the distal end.

Beetles appear in July.

Taken only in Arizona. Rare.

PHYLLOPHAGA PATERNOI Glasgow

Phyllophaga paterno Glasgow, 1925, Canad. Ent. 57: 293, 294.

Oblong-oval, usually slightly broader behind. Reddish brown to very dark chestnut; glabrous above except for occasional minute, closely recumbent hairs borne by

some of the pits on the pronotum; shining. Clypeus moderately and rather broadly emarginate, margin narrowly reflexed. Antennae 10-jointed. Claws arcuate, tooth strong, median, acute. Length 17-19 mm. (Glasgow, 23, pp. 293, 294.)

MALE. Mesal region of sterna IV-VI flattened, slightly dished; VII transversely crossed with a broad low granulose ridge and somewhat depressed along the posterior border. Sternum VIII depressed on meson and slightly concave on the posterior border. Antennal club about as long as stem. Lower spur of hind tibia unarticulated, decurved, about two-thirds as long as upper spur.

Genitalia (pl. 26, nos. 1-4 and 6). Apodeme about 4 mm. long, posterior portion transversely depressed, the border slightly emarginate. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate excised in the upper caudo-lateral region depressed and invaginated in the lower cephalo-lateral region, forming a rather broad obtuse-angled tip. Right paramere aborted, flattened, inner border curved, extended, forming a round secondary lobe terminating distad in a broad obtuse-angled flattened tip.

FEMALE. Posterior border of sternum VIII moderately concave.

Genitalia (pl. 26, nos. 5 and 7). Subgenital plates about 2.5 mm. long, attingent on dorsum of distal region, sharp pointed on sides, auriculate depressed. Pubic process at an angle composed of two thin broad stems, on edge, connate on dorsum, flared on venter of proximal region and with distal portions separate but close together, terminating in obtuse apices; lateral sides of process rather deeply impressed.

Constant in all respects.

Beetles appear in April.

Taken in Virginia and North Carolina. Rare.

PHYLLOPHAGA MARIANA Fall

Phyllophaga mariana Fall, 1929, Brooklyn Ent. Soc. Bul. 24: 111.

Rather stout oblong-oval, moderately convex, ferruginous brown, scarcely shining, thinly clothed with short grey decumbent pubescence with intermixed slightly longer erect hairs on the head, thorax, and base of elytra. Clypeus with a moderate obtusely cuspidiform emargination. . . . Length 19 mm.; width 9.2 mm. (Fall, 17, p. 111.)

Antennae 10-segmented.

Claws broadly arcuate, the tooth median and strong.

MALE. Mesal region of sterna IV-VI rounded; VII feebly flattened, granulose, anterior border slightly ridged. Sternum VIII narrow, slightly eroded, the posterior border feebly emarginate on meson. Antennal club shorter than the stem. Lower spur of hind tibia not quite so long as the upper spur, otherwise about alike, both articulated.

Genitalia (pl. 21, nos. 6-9). Apodeme about 4 mm. long, posterior portion moderately depressed, the border straight. Phallus symmetrical; phallobase long projected caudo-ventral like a snout attenuate to a pointed tip, forming an epimere. Lateral parameres are short, narrow and blunt pointed.

FEMALE. Genitalia (pl. 21, nos. 10 and 11). Subgenital plates about 3 mm. wide, attingent on the meson, the border slightly reflexed anteriorly, slightly depressed in the outer posterior portions. Pubic process concave, almost as wide as plate, about half as wide as long, squatty, lateral borders, slightly excised posteriorly and depressed, forming ansate protuberances; epical area broadly excised; basal area triangularly depressed on the meson, with a ridge extending from the apex of the depression to either side of the excised apical area and to the middle. The genital plates together with the process assume the appearance of a toad bug.

Constant in all respects.

Adults appear in April.

Taken in Georgia and Florida. Very rare.

PHYLLOPHAGA CRENULATA (Froelich)

Melolontha crenulata Froelich, 1792, Der Naturforscher, Stück 26, p. 94.

Lachnosterna crenulata, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 258.

Melolontha georgicana Gyllenhal, 1817, Synonymia Insectorum (Schoenherri) t. I, pt. 3, Appendix, p. 77.

Phyllophaga crenulata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 370.

Oblong, very little wider posteriorly, brown, feebly shining, surface clothed with short yellowish recumbent hair, often with erect hairs intermixed. Clypeus emarginate, the border reflexed. . . . Claws with a strong median tooth, alike in both sexes. Length 0.65-0.80 inch; 17-20 mm. (Horn, 27, p. 272.)

Antennae 10-segmented.

MALE. (pl. 4, no. 8). Mesal region of sterna IV-VI rounded, VII and VIII feebly depressed, the depressed area papillose. Antennal club much shorter than stem. Spurs of hind tibia about of equal length, both articulated.

Genitalia (pl. 27, nos. 1-4). Apodeme about 3 mm. long, with a transverse depression near the straight posterior border. Phallus symmetrical; phallobase narrow. Parameres aborted, united on venter, forming tubular structure about as long as wide. Caudo-ventral border emarginate in the middle; distal opening circular.

FEMALE. Genitalia (pl. 27, no. 5). Subgenital plates about 1 mm. long and about as much across, meeting anteriorly but diverging posteriorly, distal extremities frequently depressed and somewhat involute on the meson, disclosing the process above. Pubic process a thin flat plate about two-thirds as long as wide, slightly concave on the venter, protruding only slightly from the distal portions of the plates, very broadly emarginate in the center of the distal extremity; outer distal borders are rounded.

This species is constant in form, size, color, vestiture, and genital characters.

Active from the middle of March to August.

Common throughout the eastern half of the United States (fig. 14). A number of specimens were also taken in one of the Canadian provinces.

The grub of this species often injures sod land and field crops.



FIGURE 14.—Distribution of *crenulata* in the United States.

HOST FAMILIES. 1—Birch. 2—Beech, bignonia, birch, buckeye, cyrilla, dogwood, ebony, elm, grass, honeysuckle, laurel, lily, loosestrife, mallow, maple, mulberry, pine, planetree, pulse, rose, saxifrage, tupelo, vine, walnut, willow. 3—Barberry, basswood, beech, buckeye, dogwood, elm, honeysuckle, laurel, lily, planetree, pulse, rose, saxifrage, sumac, vine, walnut, willow, witchhazel.

PHYLLOPHAGA PUDOROSA

Reinhard

Phyllophaga pudorosa Reinhard, 1939, Kans. Ent. Soc. Jour. 12: 55.

Body elongate, subparallel, castaneous to piceous, head and thorax more shining, surface of latter and elytra with sparse vestiture of both long and short pale hairs. Clypeus flat, deeply emarginate, narrowly reflexed. . . . Antennae with 10 segments. Legs wholly reddish; tooth of claw long, acute, median. Length 17–18 mm.; width 7.5–9 mm. (Reinhard, 48, p. 55.)

MALE. Mesal region of sterna IV–VI slightly depressed, VII with a rather deep, arcuate depression. Sternum VIII moderately depressed, the posterior border slightly but rather sharply emarginate. Antennal club about two-thirds as long as the stem. Lower spur of hind tibia unarticulat-

ed, about one-half as long as the upper spur; both spurs acutish.

Genitalia (pl. 28, nos. 6–10). Apodeme 4 mm. long, the posterior portion deeply transversely impressed, the border undulating. Parameres asymmetrical; phallobase reduced to a collar. Left paramere somewhat conchate, rather broadly and deeply excised in the upper caudal region producing a spiny process, flattened laterally, invaginated in the lower cephalic region and ending in an obtuse apex. Right paramere, conchate, narrower than left paramere, invaginated in the lower cephalic region, obtusely processed above invagination and ending in a broader obtuse apex than left paramere.

FEMALE unknown.

Beetles appear in June.

Taken in Texas and Louisiana.

Rare.

PHYLLOPHAGA ARCTA (Horn)

Lachnosterna arcta Horn, 1887, Amer. Ent. Soc. Trans. 14: 271.

Phyllophaga arcta, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, subcylindrical, brownish, ferruginous, head piceous, thorax a little darker than the elytra, semiopaque, surface clothed with extremely fine, short pubescence. Clypeus feebly emarginate, margin narrowly reflexed. . . . Tooth of claws long, acute and median. Length 0.60–0.65 inch; 15–16 mm. (Horn, 27, p. 271.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI feebly flattened; VII ridged, the ridge processed on sides with a granulose cupuliform depression behind. Sternum VIII slightly depressed, the posterior border straight, entire. Lower spur of hind tibia articulated, about three-fourths the length of upper. Antennal club about as long as the stem.

Genitalia (pl. 27, nos. 6–9). Apodeme about 2 mm. long, posterior portion transversely depressed, the border straight. Phallus symmetrical; phallobase very broad, Parameres aborted; the upper portions rounded, converging posteriorly, resulting in

a small inverted U-shaped distal opening; lower portions platelike, arranged at right angles to upper portions, attingent on ventro-meson forming a somewhat rounded distal extremity.

FEMALE. Mesal region of sternum VII with a shallow transverse depression.

Genitalia (pl. 27, no. 10). Subgenital plates about 2 mm. across, attingent posteriorly, diverging anteriorly, depressed on venter and with distal ends truncate. Pubic process about as wide as genital plates, platelike, with sides rounded, apex deeply emarginate, ventro-meson from base of emargination to base of plate fluted, the bilobed tip rounded.

Beetles active from the latter part of June to August.

Taken only in Texas and Alabama. Very rare.

Phyllophaga opacita Reinhard (48, p. 56) (pl. 27, nos. 11-14 ♂, no. 15 ♀).

Similar to *arcta* except lower portion of the fused parameres terminating in an emarginate apex instead of a rounded apex. Taken only in Texas.

PHYLLOPHAGA ELONGATA (Linell)

Lachnosterna elongata Linell, 1896, U. S. Nat. Mus. Proc. 18: 725.

Phyllophaga elongata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Very elongate, cylindrical, finely and sparsely pubescent; rufotestaceous, moderately shining. Head as broad as anterior margin of thorax, infusate, convex . . . Clypeus with margin moderately reflexed, distinctly emarginate. Thorax rather short, evenly convex, finely and densely punctate; sides strongly arcuate and narrowed in front, parallel behind; anterior angles obtuse, posterior rectangular. Claws with a feeble sub-basal tooth. Length 16 mm. (Linell, 40, p. 725.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI moderately flattened; VII with posterior portion slightly elevated. Sternum VIII slightly depressed on meson, the posterior border straight. Antennal club about as long as the

stem. Lower spur of hind tibia unarticulated, aborted, only about one-fifth as long as the upper.

Genitalia (pl. 29, nos. 1-3). Apodeme about 3.5 mm. long, posterior border slightly concave. Phallus, symmetrical; phallobase narrow. Parameres aborted, lower lateral areas deeply and roundly excised producing short rounded anterior regions and much longer tinelike structures posteriorly which terminate into acute apices; caudo-dorsal area of structure excavated and lower inner caudal border of parameres supplied with dentate processes a short distance above the tips; structure resembles a draw hook; distal opening outline of inverted U.

FEMALE. **Genitalia** (pl. 29, no. 4). Subgenital plates about 3 mm. across, rounded on sides, attingent, anteriorly diverging, posteriorly disclosing the basal portion of the process, unsculptured. Pubic process constricted in the latitudinal axis, distal end with rounded sides and slight emargination in the middle; fluted along the ventro-mesal line, narrowly in the distal portion but increasing in width anteriorly; process resembles a capstan.

Constant in all respects.

Adults appear in July and August. Taken only in Florida. Very rare.

PHYLLOPHAGA DELATA (Horn)

Lachnosterna delata Horn, 1887, Amer. Ent. Soc. Trans. 14: 267.

Phyllophaga delata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly broader behind, piceous brown, head and thorax more shining, surface sparsely clothed with short, semierect, greyish hair. Clypeus moderately deeply broadly emarginate, border very narrowly reflexed . . . Claws curved, with a strong median tooth. Length 0.65 inch; 16.5 mm. (Horn, 27, p. 267.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI flattened; VII with a transverse, granulose, arcuate ridge and depression behind. Sternum VIII depressed with posterior portion inversely gran-

ulose, the border slightly emarginate. Antennal club about as long as the stem. Lower obtuse stubby unarticulated spur about one-half as long as the long slender acute upper spur.

Genitalia (pl. 30, nos. 10–12; pl. 31, no. 12). Apodeme about 5 mm. long, posterior portion transversely depressed, the border advanced and undulating. Phallus asymmetrical; phallobase narrow, collarlike. Left paramere much the larger of the two, conchate upper portion broadly involute, lower caudo-lateral narrowly invaginated, producing an acute tip. Right paramere feebly conchate, upper portion slightly involute, lower caudo-lateral markedly invaginated, producing a smaller secondary lobe with an obtuse tip.

FEMALE. Genitalia (pl. 31, nos. 13 and 14). Subgenital plates about 3 mm. across, attinent and ridged on meson, markedly depressed on either side of ridge and with auriculate depression on either side in the distal region. Pubic process squatty, somewhat lyrate in outline, composed of a broad proximal portion deeply excavated on ventro-meson and a two-stemmed distal portion connate for some distance, then widely diverging and terminating in clavate recurvate apices.

Active from middle of April to latter part of June.

Taken at points in central United States (fig. 15). Rare.



FIGURE 15.—Distribution of *delata* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, laurel, pine, rose, tupelo, walnut. 3—Beech, maple, pulse, walnut.

PHYLLOPHAGA SUBTONSA (LeConte)

Lachnosterna subtonsa LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 254.

Phyllophaga subtonsa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, slightly wider behind, fuscous, moderately polished, pubescent, the hairs short and semirecumbent. Clypeus rather broadly but not deeply emarginate, the margin only slightly reflexed. Claws of hind tibia broadly arcuate, the tooth median, strong, and acute. Length 19.9 mm.; width 10 mm.

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI broadly flattened; VII granulose with an arcuate ridge very prominent on sides, much less so in between. Sternum VIII broadly depressed, the posterior border slightly emarginate. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper spur. Both spurs acute.

Genitalia (pl. 31, nos. 1–5). Apodeme about 5 mm. long, posterior portion transversely depressed, with another smaller depression caudad and next to the unindented elevated border. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate, slightly depressed in dorso-lateral regions, invaginated in the lower cephalo-lateral region forming an obtuse tip; inner upper face adorned with a narrow ledgelike structure extending from the caudal border about two-thirds across the paramere. Right paramere smaller than left paramere, two-lobed, scoop-shaped, the lobes extending ventrad and forming a broadly rounded reflexed tip.

FEMALE. Genitalia (pl. 31, nos. 6 and 7). Subgenital plates 3 mm. across, attinent in the middle, diverging anteriorly and posteriorly, rounded, with deep auriculate depressions in the posterior region, one on

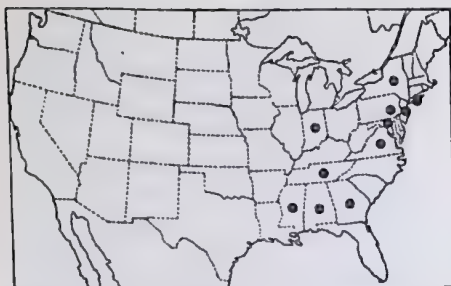


FIGURE 16.—Distribution of *subtonsa* in the United States.

either side. Pubic process isosceles triangulate, the narrow side, proximal, sides at base convolute, distal end emarginate producing a bifid, obtuse apex; venter excised; lateral sides much depressed.

This species resembles *ilicis* very closely in vestiture, color, and in genital characters except that in *ilicis* the dorso-lateral area of left paramere is roundly excised, while in *subtonsa* it is entire.

Beetles active in June and July.

Taken in several widely scattered parts in the eastern half of the United States (fig. 16). Rare.

HOST FAMILIES. 2—Beech, walnut.

PHYLLOPHAGA IROIDES Fall

Phyllophaga iroides Fall, 1929, Brooklyn Ent. Soc. Bul. 24: 112.

Subcylindrical, slightly wider behind, dark reddish brown or rufopiceous, surface distinctly iridescent, sericeous, and dull. Clypeus emarginate. . . . Claws with a moderate intramedian tooth. Length 17 mm.; width 8.75–9 mm. (Fall, 17, p. 112.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI rounded but with an impressed somewhat fluted median line; VII with a semiglobose papillose depressed area, its base sharply defined and somewhat extended; VIII very narrow transversely moderately depressed, the border slightly incurvate. Antennal club, short, only about one-fourth as long as the stem. Spurs of hind tibia slender, acutish, the lower about three-fourths as long as the upper spur.

Genitalia (pl. 32, nos. 5–8). Apodeme about 2 mm. long, the posterior region flattened, the border slightly incurvate. Phallus symmetrical; phallobase broad, anterior region somewhat flattened and slightly depressed, the posterior region with a sharply defined, longitudinal median impression. Parameres aborted, rounded laterally, confluent on venter, forming a tubular structure having a bidentate tip; distal opening ovate; aedeagus mostly membranous but supplied with chitinated supports.

FEMALE unknown.

Described from 2 males bearing label "Huachuca Mts., Arizona, VIII-16-10."

PHYLLOPHAGA SUBMUCIDA

(LeConte)

Lachnosterna submucida LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 260.

Phyllophaga submucida, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, subcylindrical, slightly broader behind, facies robust, reddish-brown or rufopiceous, surface distinctly sericeous or iridescent. Clypeus flat, emarginate, margin narrowly reflexed. . . . Claws arcuate, with an acute tooth near the base, larger in the female. Length 0.75–0.80 inch; 19–20 mm. (Horn, 27, p. 277.)

Antennae 10-segmented.

MALE. (pl. 4, no. 6). Mesal region of sterna IV–VI feebly flattened; VII transversely crossed with an undulating dark granule ridge along the depressed border, somewhat rugose on the sides above ridge. Sternum VIII with a depressed anterior border and an undulating posterior border. Antennal club about as long as the stem. Lower spur of hind tibia articulated, slightly bowed and about as long as the upper spur. Both spurs slender.

Genitalia (pl. 33, nos. 1–5). Apodeme about 4 mm. long, posterior portion depressed, the border concave. Phallus symmetrical; phallobase broad, caudo-dorsal border rounded. Parameres with lower caudo-lateral areas involute and roundly excised, forming dentate processes on

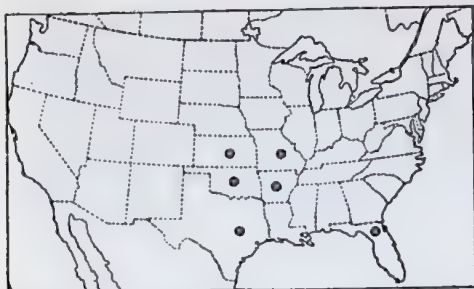


FIGURE 17.—Distribution of *submucida* in the United States.

caudal border and acute terminal apices below, pointing mesad; distal opening ovoid.

FEMALE. Genitalia (pl. 33, no. 6). Subgenital plates about 2.5 mm. wide, rounded, with an unchitinized transverse area in the middle disclosing a secondary rectangular chitinized plate, which with its supporting tissue spreads the plates anteriorly; distal portion heavily chitinized.

Constant in all respects.

Adults appear from middle of May to middle of July.

Taken mostly in south-central portion of United States (fig. 17). Common in some localities.

HOST FAMILIES. 2—Elm, walnut.

PHYLLOPHAGA CRINITA (Burmeister)

Trichestes crinita Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 359.

Lachnosterna glabripennis LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 260.

Phyllophaga crinita, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Listrochelus longiclavus Fall, 1922, Canad. Ent. 54 (8): 173.

Oblong-oval, distinctly broader behind, rufotestaceous, shining, head and thorax with moderately long erect hairs. Clypeus entire, concave, the margin rather widely reflexed. . . . Claws variable in the sexes. Length 0.50–0.64 inch; 13–16 mm. (Horn, 27, p. 286.)

Antennae 10-segmented.

MALE. (pl. 5, no. 4). Mesal region of sterna IV–VI slightly flattened and dished; VII normal with small granular area on meson; sternum VIII slightly depressed and sparsely

granulose, the border unindented. Antennal club much longer than stem. Lower spur of hind tibia articulated, about two-thirds as long as upper.

Genitalia (pl. 20, nos. 1 and 2; pl. 32, nos. 14 and 15). Apodeme about 3 mm. long, posterior portion unevenly depressed, somewhat flattened, the border broadly emarginate. Phallus symmetrical; phallobase narrow. Parameres aborted, depressed in lower lateral region, uniting and fused on the venter, adorned with two moderately long straight teeth at this point and above these another very short one along the border on either side; distal opening circular, usually inconspicuous due to the protrusion of the heavily chitinized aedeagus.

FEMALE. Genitalia (pl. 20, no. 3). Subgenital plates about 2 mm. across, attinent, diverging anteriorly, incised in the distal region producing flaps usually covering the heavily chitinized border above. Pubic process wanting.

Somewhat variable in size, some being only about half as large as others. Constant in genital characters. Species resembles *tristis* in genital characters, but can be differentiated from *tristis* in degree of vestiture, being much less hairy, generally of larger size and reddish-brown, in color, and with club of antenna much larger than stem.

Active from the latter part of April through July. Taken in Louisiana, Texas, Alabama, and Missis-

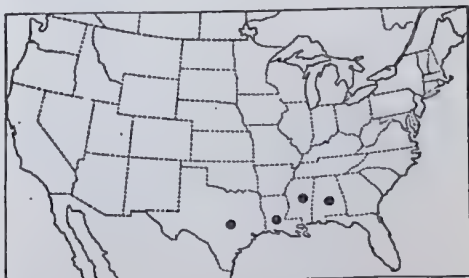


FIGURE 18.—Distribution of *crinita* in the United States.

sippi (fig. 18). Common in southern Texas where it is one of the most abundant species.

Phyllophaga antennata Smith

Specimens labeled *antennata* studied are similar to *crinita* in genital characters and similar to a small *crinita* in superficial characters and are from the same habitat.

HOST FAMILY. 2—Walnut.

PHYLLOPHAGA TRISTIS (Fabricius)

Melolontha tristis Fabricius, 1781, Species Insectorum, Tomus I, p. 39.

Lachnosterna tristis, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 261.

Melolontha pilosicollis Knoch, 1801, Neue Beytraege zur Insectenkunde, Teil I, p. 85.

Phyllophaga tristis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 370.

Oblong-elongate, slightly broader behind, sometimes slightly oval, yellowish testaceous, sometimes slightly reddish, sparsely clothed with short semi-erect hair on the elytra, with longer erect hair on the thorax and at base of elytra. Clypeus entire (pl. 2, fig. 18), concave . . . Claws slightly curved, the tooth acute, moderate in size and median ♀ or smaller and intramedian ♂. Length 0.45–0.60 inch; 11.5–15 mm. (Horn 27, p. 286.)

Antennae 10-segmented.

MALE. (pl. 6, no. 5). Mesal region of sterna IV–VI flattened; VII with a distinct sharp ridge in anterior portion. Sternum VIII with a slight depression on meson and slight elevation along anterior border. Antennal club about as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper spur. Both spurs slender and acute.

Genitalia (pl. 32, nos. 9–12). Apodeme 3 mm. long, the rounded posterior border slightly concave. Phallus symmetrical; phallobase narrow. Parameres aborted, united on venter, caudo-ventral border slightly incised, producing a short blunt tooth at either end of incision. Cephalo-ventrad on meson are two moderately long, sharp teeth close together. Distal opening somewhat circular nar-

rowing dorsad and forming a sharp angle on the meson of phallobase.

FEMALE. Genitalia (pl. 32, no. 13). Simple, consisting only of the plates about 1.5 mm. long and about as wide, heavily chitinized at their distal ends, attingent on meson, deeply obliquely incised near the caudal extremities. Sometimes the plates are almost colorless except at their distal ends. Pubic process wanting.

Species is usually constant in form, color, size, vestiture, and genital characters. It resembles *crinita* and *antennata* closely in genital characters. Three new subspecies have been described mainly from variations in the form of the aedeagus: *tristis apicata* Reinhard, *tristis suttonana* Reinhard, and *tristis amplicornis* Reinhard (48, pp. 57–60).

Adults active from first week in March to latter part of June.

Widely distributed, found practically throughout the eastern half of the United States (fig. 19), and in two widely separated provinces of southern Canada. It is a common species in some of the northern states of the United States, and the grubs are classed as one of the species injurious to crops.

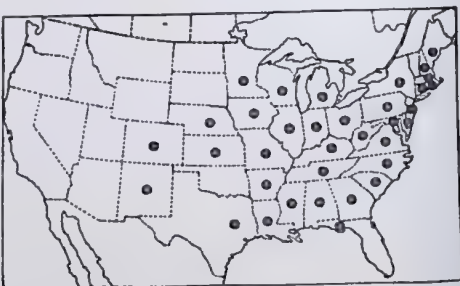


FIGURE 19.—Distribution of *tristis* in the United States.

HOST FAMILIES. 1—Rose. 2—Beech, birch, dogwood, ebony, elm, heath, honeysuckle, maple, olive, pine, planetree, pulse, rose, sumac, walnut, willow, witchhazel. 3—Beech, elm, olive, rose, saxifrage, walnut, willow.

PHYLLOPHAGA DENTEX (Bates)**New Combination**

Lachnosterna dentex Bates, 1888, Biol. Cent. Amer. 2 (2): 192.

Related to *P. ravida*; claws similar, however different body, pilose with hair erect. Less oblong-ovate, rufotestaceous, shining, erect hair; club of antennae pale; clypeus concave, margin reflexed, not emarginate. Length 16 mm. (Bates, 2, p. 192.)

MALE. (pl. 5, no. 12). Mesal region of sterna IV–VI flattened, dish-shaped; VII flattened, papillose. Sternum VIII slightly depressed, with a shallow longitudinal groove, the posterior border straight, entire. Antennal club not quite as long as the stem. Lower spur of hind tibia truncate, slender, articulated, and almost as long as the acute slender upper spur.

Genitalia (pl. 33, nos. 7–10). Apodeme about 2.5 mm. long, posterior border slightly concave. Phallus symmetrical; phallobase very narrow. Parameres aborted, depressed in upper lateral regions, united on venter forming a mono-dentate tip bent cephalad; aedeagus exposed bearing chitinized accessories.

FEMALE. Genitalia (pl. 33, no. 11). Subgenital plates about 2 mm. across, somewhat distant on meson, invaginated on either side of the distal end forming aureate depressions which are unchitinized. Pubic process wanting.

Beetles appear in July.

Taken in the Huachuca Mountains in Arizona, and in Oklahoma. Rare.

CLASS III**PHYLLOPHAGA LATIFRONS****(LeConte)**

Lachnosterna latifrons LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 241.

Phyllophaga latifrons, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, cylindrical, variable in color from purplish-brown to rufotestaceous; surface in the darker specimens decidedly pruinose. Abdomen always pale. Clypeus entire, concave, the margin rather widely reflexed. . . . Claws feebly arcuate, the tooth median, very small in the male, larger in the female. Length 0.60–0.72 inch; 15–18 mm. (Horn, 27, p. 221.)

Antennae 10-segmented.

MALE. (pl. 5, no. 13). Mesal region of sterna IV–VI fluted; VII with a cupuliform concavity on meson and secondary depressions on the sides, the caudal border on meson extended distad. Sternum VIII deflexed, deeply depressed, bidentate on meson of caudal border. Antennal club slightly longer than the stem. Lower spur of hind tibia stout, unarticulated, obtuse, and somewhat less than one-half as long as the upper, slender, attenuate spur.

Genitalia (pl. 34, nos. 1–4). Apodeme 3 mm. long, posterior portion

transversely depressed, the border markedly concave. Membranous area broadly ovate. Phallus symmetrical; phallobase broad, the cephalic end excised, the excision rather sharp pointed. Parameres aborted, the posterior portions extend laterad and caudad, forming rounded caudo-lateral borders, coming together on the meson of the caudo-ventral region; laterad of the meeting point there is a slight emargination on each paramere and laterad of each emargination a dentate protuberance; anterior portions of the lobes are extended laterad and cephalad much depressed laterally and finally fold over onto the venter terminating in broad rounded tips. Distal opening circular in outline.

FEMALE. Genitalia (pl. 34, no. 5). Subgenital plates about 2 mm. wide, about as long as wide, unsculptured, touching only in the cephalic region; posteriorly the plates diverge widely due to the process above. Pubic process somewhat oval in outline, its posterior portion attenuate and terminating in a bidentate tip, the teeth slender, sharp pointed and somewhat

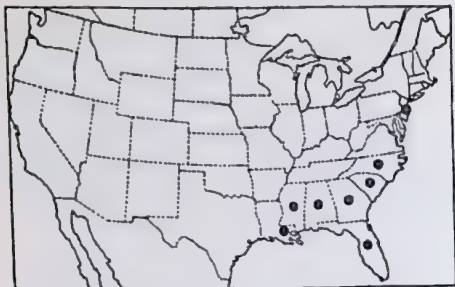


FIGURE 20.—Distribution of *latifrons* in the United States.

recurvate, fluted on meson particularly in the posterior region giving the process an appearance as though in the act of dehiscence.

Variable in color, from light brown to black and with a variable degree of pruinosity, constant in sexual characters.

Beetles appear from early March to latter part of July.

Occurs in central and south Atlantic and east Gulf States (fig. 20). Not a common species.

HOST FAMILIES. 2—Beech, pine, walnut.

PHYLLOPHAGA PRUNUNCULINA (Burmeister)

Trichestes prununculina Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 360.

Lachnosterna cerasina LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 241.

Phyllophaga prununculina, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Robust cylindrical, variable in color from reddish-brown to black; surface sometimes shining, often slightly pruinose, rarely with a dull smoky surface. Clypeus feebly broadly emarginate, the margin moderately reflexed . . . Claws with a moderate tooth near the base in both sexes. Length 0.56–0.70 inch; 14–18 mm. (Horn, 27, p. 223.)

Antennae 10-segmented.

MALE. (pl. 5, no. 15). Mesal region of sterna IV–VI slightly flattened; VII slightly depressed and rugose near the caudal border, with an oblique ridge on either side. Sternum VIII with a cupuliform shiny depression, and a hairy cusp or pro-

tubérance on either side. Antennal club longer than stem. Lower spur of hind tibia usually wanting, sometimes appears as an aborted spur. Upper spur long and slender.

Genitalia (pl. 29, nos. 9–11). Apodeme about 2 mm. long, posterior border flattened, the border decidedly concave. Phallus symmetrical; phallobase narrowed by an excision in anterior region. Membranous area ovate. Parameres aborted, rounded posteriorly, depressed on lateral sides, excised on lower lateral borders producing a sharp protuberance on each side, extended anteriorly toward the ventro-meson forming a short outer and a long, rounded inner tooth on either side; distal opening ovate.

FEMALE. Genitalia (pl. 29, no. 12). Subgenital plates rounded about 2 mm. wide, line of suture somewhat depressed. Pubic process composed of a plate with a semicircular or V-shaped excision at the distal end, distal area around excision depressed, proximal area somewhat rounded.

Variable in color, sometimes almost black or bluish black, sometimes head and thorax reddish brown and elytra black, usually reddish brown all over with a bloom. In size somewhat unequal and in form quite similar, genital characters constant.

Adults appear from latter part of March to middle of July, a midsummer species.

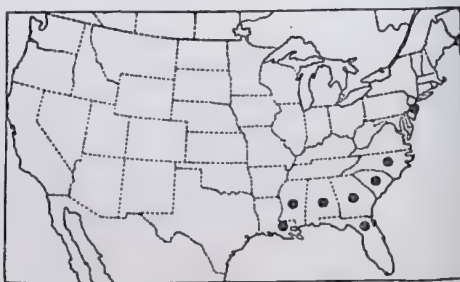


FIGURE 21.—Distribution of *prununculina* in the United States.

Occurs in Central and South Atlantic and East Gulf States (fig. 21). Common on pine in Sand Hill regions of South Carolina.

HOST FAMILIES. 2—Beech, ebony, pine, rose.

PHYLLOPHAGA QUERCUS (Knoch)

Melolontha quercus Knoch, 1801, Neue Beytraege zur Insectenkunde, Theil I, p. 72.

Phyllophaga quercus, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, cylindrical, rufotestaceous, head darker, elytra paler, surface glabrous, pruinose. Clypeus emarginate, margin narrowly reflexed. . . . Claws arcuate, with a strong median tooth in both sexes. Length 0.58–0.64 inch; 14.5–16 mm. (Horn, 27, p. 281.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI feebly flattened; VII depressed with a moundlike elevation on either side, the depressed area granulose, the outer bases of elevations sometimes rugose. Sternum VIII narrow, slightly depressed, posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia articulated, curved near obtuse tip, slender, and about two-thirds as long as the upper less obtuse spur.

Genitalia (pl. 35, nos. 10–11). Apodeme 2 mm. long, slightly depressed in the posterior region, the border slightly concave. Phallus symmetrical; phallobase broad. Parameres long extended caudo-laterad ending in blunt apices, the tips pointing ventro-mesad and usually attinent; distal opening ovate.

FEMALE. Genitalia (pl. 35, no. 12). Subgenital plates about 2 mm. across, diverging anteriorly, attinent posteriorly, unsculptured. Pubic process composed of a broad plate tulip-shaped, posterior portion bilobed, produced by a V-shaped excision in the middle, usually only the lobes are exerted and visible; lobes sometimes truncate, sometimes obtuse at tips.

Constant in superficial characters, except in color which varies from light to dark brown; also constant in genital characters.

Adults appear from latter part of April to middle of July.

Occurs in most of the eastern half of the United States except New England (fig. 22). Fairly common in some districts.

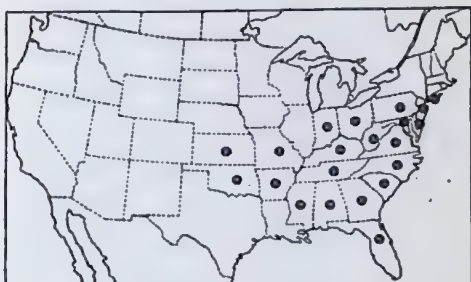


FIGURE 22.—Distribution of *quercus* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, grass, laurel, magnolia, pulse, rose, sumac, tupelo, walnut, willow.

PHYLLOPHAGA SUBPRUINOSA (Casey)

Lachnosterna subpruinosa Casey, 1884, Contributions to the Descriptive and Systematic Coleopterology of North America, Part I, p. 38.

Phyllophaga deani Luginbill, 1928, Ent. Soc. Amer. Ann. 21: 78.

Phyllophaga subpruinosa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 379.

Oval, slightly oblong, castaneous, feebly pruinose, slightly shining. Clypeus very feebly sinuate at middle, the margin moderately reflexed. . . . Claws feebly curved, the tooth small and median. Length 0.60 inch; 15 mm. (Horn, 27, p. 239.)

Antennae 10-segmented.

MALE. (pl. 7, no. 6). Mesal region of sterna IV–VI flattened, slightly dished; VII crossed transversely with an arcuate ridge, caudad of which is a deep rugose depression. Sternum VIII with a deep depression confluent with the indentation of the preceding segment, the posterior border slightly concave (pl. 9, no. 12). Antennal club about as long as the stem. Lower spur of

hind tibia unarticulated, about two-thirds as long as the upper spur.

Genitalia (pl. 34, nos. 6-9). Apodeme about 5 mm. long, rather narrow, posterior portion with a transverse depression, its border deeply excised. Phallus symmetrical; phallobase very narrow. Parameres with caudo-lateral portions extended, forming broad tips bent ventro-mesad, tips facing each other; cephalo-ventral portion of each paramere supplied with a short blunt tooth pointing cephalo-mesad; distal opening somewhat ovate.

FEMALE. Genitalia (pl. 34, nos. 10 and 11). Subgenital plates rounded, about 2 mm. wide, suture well defined, middle of each plate transversely depressed. Pubic process short with a slender proximal stem and a diverging distal portion somewhat depressed in the middle and slightly emarginate at apex, fleshy folds dorsad of process sometimes chitinized.

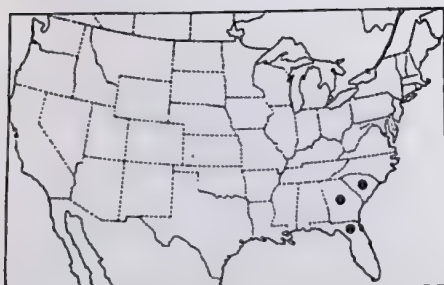


FIGURE 23.—Distribution of *subpruinosa* in the United States.

Constant in every respect.

Adults appear in April and May.

Occurs along south Atlantic coast (fig. 23).

HOST FAMILY. 2—Beech.

PHYLLOPHAGA MICANS (Knoch)

Melolontha micans, Knoch, 1801, Neue Beytraege zur Insectenkunde, Theil I, p. 77.

Ancylonycha micans, Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 138.

Lachnosterna micans, LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 247.

Phyllophaga micans, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, slightly broader behind, brownish-black, surface with a pruinose coating and consequently opaque. Clypeus concave and feebly emarginate, the border moderately reflexed . . . Claws arcuate, the tooth median, moderate in the male, large in the female. Length 0.59-0.68 inch; 15-17 mm. (Horn, 27, p. 242.)

Antennae 10-segmented.

MALE. (pl. 5, no. 8). Mesal region of sterna IV-VI flattened, dish-shaped; VII with a transverse arcuate ridge, rounded on meson, sharp edged on the sides. Sternum VIII moderately depressed, the posterior border with a rather deep angular incision (pl. 9, no. 9). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, slightly decurved or arcuate and about half as long as upper spur. Both spurs slender (pl. 1, no. 3).

Genitalia (pl. 36, nos. 1-4). Apodeme 4 mm. long, posterior portion shorter and narrower than the anterior one, the former with a moderate depression on meson, its caudal border slightly concave. Phallus symmetrical; phallobase collarlike. Parameres deeply excised on the upper borders, producing sharp-pointed, spinelike protuberances on the upper caudal margins; caudal margins below protuberances somewhat rounded, depressed, the borders flattened, ending in broad flat tips.

FEMALE. Genitalia (pl. 36, no. 5). Subgenital plates thick, somewhat divergent anteriorly, posteriorly transversely depressed producing a ledge, laterally the posterior section bears an auriculate depression. Pubic process, composed of two short, thick clavate stems, connate, usually inserted for the whole length.

Usually constant in all respects.

Beetles appear from middle of March to middle of June.

Rather widely distributed over the eastern half of the United States (fig. 24). Common in the South-eastern States.



FIGURE 24.—Distribution of *micans* in the United States.

HOST FAMILIES. 2—Beech, birch, dogwood, ebony, elm, heath, honeysuckle, logania, loosestrife, magnolia, mahogany, mallow, maple, olive, pine, pulse, rose, saxifrage, sumac, tupelo, vine, walnut, willow, witchhazel. 3—Beech, honeysuckle, laurel, pulse, rose, tupelo, walnut, witchhazel. *Phyllophaga micans* var. *cupuliformis* Langston (31, p. 450).

Similar to *micans*. This form has cupuliform concavity on sterna VII and VIII of male. Parameres of male phallic structure keeled on caudal border (pl. 36, nos. 6–9). Female genitalia (pl. 36, nos. 10 and 11) with transverse depression on genital plates much accentuated producing a broad ledge with a cuplike depression; stems of public process broad, uniform in thickness, connate, without emargination at apex.

Occurs in several of the southeastern States (fig. 25).



FIGURE 25.—Distribution of *micans* var. *cupuliformis* in the United States.

HOST FAMILIES. 2—Beech, ebony, rose, tupelo, walnut, willow, witchhazel.

Phyllophaga sacoma Reinhard 48, p. 52 (pl. 29, nos. 5–7 ♂; no. 8 ♀.)

Reddish brown, upper portion of parameres not spinose, merely angular. Taken in Arkansas and Texas.

PHYLLOPHAGA SOCIATUS (Horn)

Lachnosterna sociatus Horn, 1878, Amer. Ent. Soc. Trans. 7: 146.

Oblong-ovate, reddish brown, very faintly pruinose. Clypeus transverse, feebly truncate, angles broadly rounded, margin very narrowly reflexed. Length 0.54 inch; 13.5 mm. (Horn, 26, p. 146.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VII rounded, somewhat tumid in the region of VI and anterior part of VII. Sternum VIII slightly impressed, the posterior border moderately concave. Antennal club much shorter than the stem. The lower round tipped spur of hind tibia, almost as long as the upper obtuse spur, both spurs unarticulated.

Genitalia (pl. 28, nos. 1–4). Apodeme about 3 mm. long, the posterior portion moderately depressed, the border somewhat undulating. Phallus asymmetrical, phallobase very broad, the posterior border concave. Left paramere aborted, supplied with a slender acute spine on the lower caudo-lateral border and terminating in a stout acute slightly curved spine on the ventro-meson. Right paramere more aborted than the left paramere, supplied with a rather long bat-shaped process on the lower caudo-lateral border and terminating in a stubby spiny process on the ventro-meson. Aedeagus well developed, tubular, heavily chitinized, somewhat flattened on venter and bearing a hinged rather long and slender process on dorsum. Distal opening oval.

FEMALE. Genitalia (pl. 28, no. 5). Subgenital plates about 2 mm. across, attinent, the middle depressed, diverging distad, the distal borders undulating. Pubic process composed of

a broad depressed proximal portion and two flat recurvate diverging distal portions having truncate apices.

Adults appear in July.

A southwestern species. Rare.

PHYLLOPHAGA IMPAR (Davis)

Phyllophaga impar Davis, 1920, Ill. Nat. Hist. Survey Bul. 13 (art. 12): 335.

Body oblong, slightly broadest behind, reddish brown or darker, the surface sometimes shining but usually more or less pruinose, and in one specimen the surface has a dull smoky appearance such as sometimes occurs in *P. prununculina*. Clypeus feebly emarginate, moderately reflexed . . . Claws strongly arcuate and with a moderately large median tooth. Length 13 mm. (Davis, 12, pp. 335-336.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI slightly flattened; VII not conspicuously sculptured, somewhat pruinose on the sides and papillose on meson. Sternum VIII narrow with a transverse depression near the cephalad border and a slightly concave posterior border. Antennal club about as long as the stem. Lower spur of hind tibia obtuse, unarticulated, somewhat less than one-half as long as the slender acute upper spur.

Genitalia (pl. 20, nos. 4-7). Apodeme 3 mm. long with a transverse groove in the posterior region, posterior border concave. Phallus asymmetrical; phallobase reduced to a collar, ventral portions of collar flattened producing truncate tips. Left paramere conchate, much the larger of the two, strongly arcuate, the blunt tip pointing cephalad. Right paramere much aborted, appearing as if the greater portion of the lobe were cut off with a sharp instrument, leaving only a small portion in the cephalo-lateral region; tip rounded.

FEMALE. Genitalia (pl. 20, no. 8). Subgenital plates widest anteriorly about 4 mm. across, mesal suture distinct; distal portion invaginated forming pocketlike depressions on sides, on meson terminating in obtuse tips. Pubic process platelike with a deep, narrow apical excision almost

dividing plate into two parts and producing a bi-clawlike tip; somewhat depressed on meson.

Beetles active in March and April.

Taken only in North and South Carolina. Rare.

PHYLLOPHAGA PRUNINA (LeConte)

Lachnosterna prunina, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 251.

Ancylonycha pruinosa Melsheimer, 1846, Acad. Nat. Sci. Phila. Proc. 2 (1844-45): 139.

Phyllophaga prunina, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong-ovate, facies moderately robust, castaneous to piceous, surface pruinose in well-preserved specimens; when the pruinosity is removed the surface is feebly shining. Clypeus broadly emarginate (pl. 2, no. 19), margin narrowly reflexed . . . Claws curved, strongly toothed at middle in both sexes. Length 0.67-0.74 inch; 17-18.5 mm. (Horn, 27, p. 234.)

Antennae 10-segmented.

MALE. (pl. 4, no. 10). Mesal region of sterna IV-VI flattened, slightly dished and granulose; VII with a broad, transverse, granulose, arcuate ridge, the posterior slope of which is steep, the anterior rounded. Sternum VIII markedly depressed, the area slightly granulose, posterior border broadly but narrowly emarginate. Antennal club somewhat shorter than stem. Lower spur of hind tibia unarticulated, acute, somewhat spiny and about two-thirds as long as the upper obtuse spur.

Genitalia (pl. 37, nos. 1-5). Apodeme about 5 mm. long, deeply transversely depressed in the posterior region, posterior border deeply emarginate. Phallus asymmetrical; phallobase narrow with sloping subdorsal sides producing a hump on the dorsum. Left paramere excised in the upper lateral area, also on the lower lateral area producing a blunt tip with another excision at its outer base on the caudal border forming a secondary somewhat recurvate tip. Right paramere fluted along the lateral side, excised in the upper lateral border, much depressed on the inner

face, terminating in a blunt tip with a small hump near its outer base where the channel ends.

FEMALE. Posterior border of sternum VIII with a well-defined, somewhat circular depression on meson.

Genitalia (pl. 37, no. 6). Subgenital plates about 1.5 mm. across, longer than wide, attingent on meson, distal portions on meson sharp pointed, on sides depressed. Pubic process composed of two stout stems connate in the proximal region, widely diverging distad and terminating in club-shaped apices.

Fairly constant in size but variable in color from reddish brown with little bloom to bluish black and intensely pruinose; variable in male phallic structure, particularly in shape of right paramere, where the channel sometimes is emphasized and gives the paramere a bilobed appearance.

Beetles appear from middle of March to middle of July.

Taken mostly throughout the central portion of the United States (fig. 26). Not abundant.

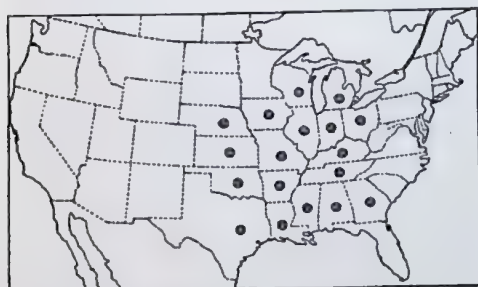


FIGURE 26.—Distribution of *pruinosa* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, laurel, pine, rose, walnut. 3—Basswood, beech, elm, honeysuckle, laurel, pulse, rose, vine, walnut, willow, witchhazel.

PHYLLOPHAGA CRASSISSIMA (Blanchard)

Ancylonychia crassissima Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 133.

Lachnosterna obesa LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 251.

Lachnosterna robusta LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 257.
Lachnosterna generosa Horn, 1887, Amer. Ent. Soc. Trans. 14: 222.
Phyllophaga crassissima, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Ovate, robust, castaneous or brown, when recent slightly iridescent, shining. Clypeus very feebly emarginate, the margin moderately reflexed. . . . Claws curved, the tooth moderate and slightly intramedian ♂, or stronger and median ♀. Length 0.60–0.82 inch; 15–21 mm. (Horn, 27, p. 238.)

Antennae 10-segmented.

MALE. (pl. 4, no. 4). Mesal region of sterna IV–VI flattened; VII with a transverse slightly bowed granulo-ridge near the posterior border; VIII with a cupuliform depression, the posterior border slightly concave (pl. 9, no. 11). Antennal club a little longer than stem. Lower spur of hind tibia unarticulated, about one-half as long as the upper.

Genitalia (pl. 37, nos. 7–10). Apodeme about 4 mm. long, slightly depressed in the posterior region, the border slightly concave. Phallus symmetrical; phallobase narrow. Parameres excised and flattened in the dorso-lateral areas, producing sharp protuberances on the upper caudal border and secondary protuberances along the excised borders; excised in the caudo-ventral areas producing hamate apices; caudal portions of parameres keeled.

FEMALE. Posterior border of sternum VIII concave.

Genitalia (pl. 37, nos. 11 and 12). Subgenital plates about 2.5 mm. across, attingent on meson, slightly depressed in the middle and with auriculate depression on either side of the distal end. Pubic process composed of two stems connate in the proximal region, separate and widely diverging distad ending in truncate apices.

Variable in superficial characters. Some specimens reddish brown without any bloom, others darker brown and markedly pruinose. Variation in size not marked. Genital characters

constant in male, slight variation in length of the stems of pubic process of the female genitalia.

Beetles appear from mid-March to mid-August.

Taken mostly in the central part of the United States. (fig. 27). Abundant and destructive to crops in some sections.



FIGURE 27.—Distribution of *crassissima* in the United States.

HOST FAMILIES. 2—Buckwheat, elm, geranium, mulberry, plantain, primrose, rose, tupelo. 3—Elm.

PHYLLOPHAGA JUVENILIS (Fall)

Listrochelus juvenilis Fall, 1932, N. Y. Ent. Soc. Jour. 40: 200.

Oblong cylindrical, entirely flavotestaceous; surface without hairs and not in the least pruinose, moderately shining, not perceptibly alutaceous. Clypeus moderately reflexed, truncate with rounded angles. Clypeal suture lightly impressed. Claws alike on all the feet, a small acute tooth at basal third or two-fifths between the tooth and the base crenulate. Length 7.25 mm.; width 3 mm. (Fall, 19, p. 200.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VIII rounded without an impression or sculpture; the posterior border of VIII slightly undulating. Antennal club somewhat less than one-half the length of the stem. Lower spur of hind tibia about two-thirds as long as the upper spur; both spurs slender and acute.

Genitalia (pl. 38, no. 10). Apodeme about 1.5 mm. long, the posterior border somewhat undulating. Phallus symmetrical; phallobase broad. Parameres aborted, attinent on ventro-meson, the lower caudal

borders extended into clavate processes, one on either side.

FEMALE unknown.

Beetles appear in July. Taken only in Arizona. Rare.

PHYLLOPHAGA TUSA (Horn)

Lachnosterna tusa Horn, 1887, Amer. Ent. Soc. Trans. 14: 290.

Phyllophaga tusa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Moderately elongate, subdepressed, slightly broader behind, beneath pale yellowish testaceous, thorax with large anterior piceous spot, elytra testaceous, but darker than the under side, surface moderately shining. Clypeus concave, entire, the margin broadly reflexed. . . . Claws arcuate, the tooth moderate, placed near the base. Length 0.47 inch; 12 mm. (Horn, 27, p. 290.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI flattened, somewhat dished; sternum VII crossed transversely in the middle by an acute ridge, undermined behind, supplied with short rounded process at the mesal point. Sternum VIII slightly depressed, the posterior border entire. Antennal club somewhat longer than the stem. Lower spur articulated, about as long as the upper spur, both obtuse.

Genitalia (pl. 38, nos. 1–4). Apodeme 2 mm. long, its posterior region depressed on the sides, the border deeply and roundly excised. Phallus symmetrical; phallobase very narrow, due to a rather deep excision in anterior region. Membranous area large, somewhat diamond shaped. Parameres with outer lateral and inner faces depressed, extended into rather long acute tips pointing cephalad.

FEMALE unknown.

Beetles active in May.

Known only from Texas and Arizona. Not common.

PHYLLOPHAGA CLYPEATA (Horn)

Lachnosterna clypeata Horn, 1887, Ent. Amer. 3: 145.

Lachnosterna integra LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 258.

Phyllophaga clypeata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly broader behind, rufotestaceous, moderately shining . . . Clypeus entire, concave, the border rather widely reflexed . . . Claws feebly curved, the tooth small and intramedian. Length 0.65–0.70 inch; 16.5–18 mm. (Horn, 27, p. 283.)

Antennae 9–segmented.

MALE. (pl. 5, no. 14). Mesal region of sterna IV–VII fluted, granulose on VII. Sternum VIII with a dark depressed dull area, which gradually becomes narrower cephalad, granulose behind; posterior border, straight, entire. Antennal club about as long as the stem. Lower spur of hind tibia articulated, somewhat stouter and about two-thirds as long as the upper.

Genitalia (pl. 39, nos. 1–4). Apodeme about 4 mm. long, considerably arched, posterior portion flattened, the border deeply concave. Phallus symmetrical; phallobase narrowed by an excision in cephalad region. Membranous area somewhat circular. Parameres aborted, lateral sides and caudal regions rounded; cephalo-lateral portion of each paramere is long extended, deeply depressed along the cephalic border and terminates in a blunt tip on the ventro-meson; ventral borders of parameres immediately behind depression, slightly humped; distal opening somewhat circular.

FEMALE. Posterior border of sternum VIII slightly concave.

Genitalia (pl. 39, nos. 5 and 6). Subgenital plates rounded, about 2 mm. across, unsculptured, attinent in the middle, diverging distad and

forming rounded tips. Pubic process composed of a strong stem attenuate to an emarginate apex, fluted on ventro-meson, markedly in the proximal portion, evanescent distad. Process resembles that of a female of *congrua* somewhat.

Constant in superficial characters, also in genital characters.

Active from June to August.

Occurs in Southeastern States (fig. 28). Not common.

HOST FAMILY. 2—Pine.

PHYLLOPHAGA DISPAR (Burmeister)

Trichestes dispar Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 361.

Lachnosterna boops Horn, 1887, Amer. Ent. Soc. Trans. 14: 284.

Phyllophaga dispar, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, cylindrical, castaneous to piceous, shining. Head broad, eyes large and prominent. Clypeus entire, the margin moderately reflexed . . . Claws feebly curved, a small tooth, median in the female, slightly intramedian in the male. Length 0.45–0.50 inch; 11.5–13 mm. (Horn, 27, p. 284.)

Antennae 9–segmented.

MALE. Mesal region of sterna IV–VI slightly flattened; VII slightly granulose and somewhat plicate on either side. Sternum VIII depressed with a bidentate protuberance arising from the middle and extending caudad, the border emarginate, the sides rounded and somewhat advanced. Antennal club about as long as the stem. Lower articulated spur of hind tibia almost as long as the upper.

Genitalia (pl. 40, nos. 1–4). Apodeme about 2 mm. long, much shorter than the phallic structure, somewhat transversely depressed in the posterior portion, the posterior border with a V-shaped excision; anterior portion of phallic structure also with a V-shaped excision; membranous area diamond-shaped. Phallus symmetrical; phallobase broad. Parameres well developed, caudal borders extended, terminating in short spinose hooks pointing cephalo-

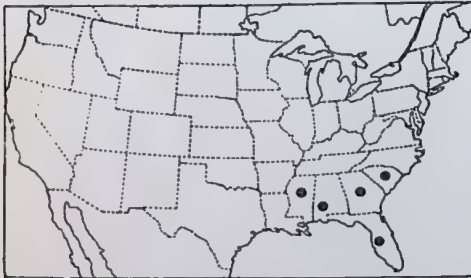


FIGURE 28.—Distribution of *clypeata* in the United States.

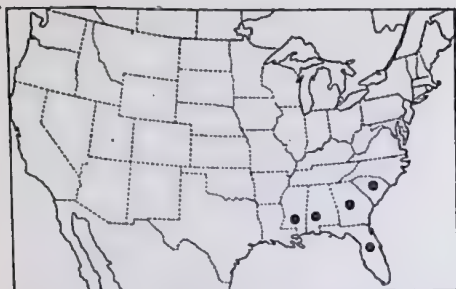


FIGURE 29.—Distribution of *dispar* in the United States.

mesad; ventral borders involute and depressed near the middle, long extended anteriorly and terminating in blunt somewhat protruding tips accentuated by flutations in the upper cephalo-lateral border of the outer faces; distal opening narrowly ovate.

FEMALE. Genitalia (pl. 40, nos. 5 and 6). Subgenital plates about 1 mm. across, attingent on meson, diverging widely anteriorly and posteriorly. Pubic process composed of a long stem about 2 mm. long, curved dorsally, attenuate, and forming a bidentate tip; ventro-meson fluted; resembles somewhat letter S.

Constant in all characters.

Beetles appear from June to August.

Occurs in Southeastern States (fig. 29). Not abundant.

HOST FAMILY. 2—Pine.

PHYLLOPHAGA CLEMENS (Horn)

Lachnosterna clemens Horn, 1887, Ent. Amer. 3: 144.

Phyllophaga clemens, Glasgow, 1916, Ill. Nat. Hist. Survey, Bul. 11 (art. 5): 373.

Phyllophaga howei Sanderson, 1937, Kans. Ent. Soc. Jour. 10: 17.

Oblong, slightly broader behind, rufotestaceous, shining, head piccous. Clypeus concave, entire, margin rather widely reflexed. . . . Claws feebly arcuate, the tooth very small and intramedian ♂, or stronger ♀. Length 0.40–0.46 inch; 10–11.5 mm. (Horn, 27, p. 227.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI dished; VII markedly depressed on meson except the posterior border which is slightly elevated. Sternum

VIII slightly depressed on meson. Antennal club about as long as the stem. The lower spur of the hind tibia aborted, unarticulated, stubby, less than one-half as long as the slender obtuse upper spur.

Genitalia (pl. 40, nos. 7–9). Apodeme about 2 mm. long, transversely depressed in the posterior region, the border deeply incised, thickened and slightly elevated at the base of incision. Phallus symmetrical; phallobase rather broad. Membranous area nearly diamond-shaped. Parameres at right angles to apodeme, attenuate to rather broad obtuse tips, lateral sides slightly depressed.

FEMALE unknown.

Taken in June.

Taken in several of the Southeastern States (fig. 30). Rare.

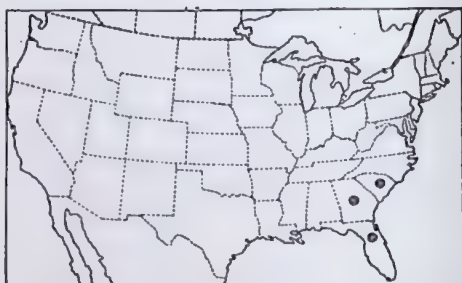


FIGURE 30.—Distribution of *clemens* in the United States.

PHYLLOPHAGA LOTA Luginbill

Phyllophaga lota Luginbill, 1928, Ent. Soc. Amer. Ann. 21: 87.

Body oblong-elongate, parallel, cylindrical, rufotestaceous, moderately shining. Clypeus entire, margin rather broadly reflexed. . . . Claws arcuate, median tooth obsolete. Length 12.3 mm. (Luginbill, 42, p. 87.)

Antennae 9-segmented.

MALE. (pl. 5, no. 11). Mesal region of sterna IV–VI feebly dished; VII feebly transversely depressed in the middle and slightly granular, posterior border slightly raised. Sternum VIII slightly depressed, the area granulose. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, obtuse and

about one-half as long as the upper slender acute spur.

Genitalia (pl. 41, nos. 1-4). Apodeme about 2.5 mm. long, moderately depressed on either side of meson in posterior region, the border pulvinate. Phallus symmetrical; phallobase narrow, deeply concave anteriorly. Membranous area circular. Parameres aborted, the lateral sides rounded; lower caudal portions extended into short protuberances, which point mesad and are bidentate at their apices, distal opening oblong oval.

FEMALE. Genitalia (pl. 41, nos. 5 and 6). Subgenital plates about 2 mm. wide, attingent on meson, diverging posteriorly, unsculptured distal ends obtuse. Pubic process composed of a broad proximal portion and a stemlike distal portion, proximal portion rounded on sides with a depression in middle, distal portion somewhat attenuate.

Constant in all respects, including genital characters. Beetles appear from latter part of May to early July.

Occurs in Southeastern States (fig. 31). Rare.

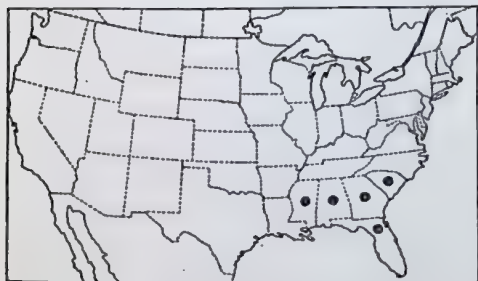


FIGURE 31.—Distribution of *Iota* in the United States.

HOST FAMILIES. 2—Pine, plane-tree, willow.

PHYLLOPHAGA DIFFINIS (Blanchard)

Ancylonycha diffinis Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 138.

Trichestes comans Burmeister, 1855,

Handb. der Ent., Bd. 4, Abt. 2, p. 358.
Lachnosterna sororia LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 246.
Lachnosterna rufiola LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 256.
Phyllophaga diffinis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, nearly parallel, rather depressed, rufoferruginous, shining. Clypeus faintly sinuate at middle, margin moderately reflexed . . . Claws feebly curved, the tooth small and median ♂. Length 0.60 inch; 15 mm. (Horn, 27, p. 243.)

Antennae 9-segmented.

MALE. (pl. 5, no. 7). Mesal region of sterna IV-VI dished; VII granulose with a rather inconspicuous transverse broad arcuate ridge and somewhat plicate on sides. Sternum VIII slightly depressed on the meson, the border slightly convex. Antennal club somewhat larger than the stem. Lower unarticulated spur of hind tibia about two-thirds as long as the upper spur.

Genitalia (pl. 39, nos. 7-11). Apodeme about 3 mm. long, moderately depressed in the posterior region, the border slightly concave. Phallus symmetrical; phallobase narrow, collarlike, somewhat convex on the cephalic border to fit the concavity of the apodeme. Left paramere deeply and hemispherically excised on the lower anterior border, producing a clawlike tip below and a smaller protuberance immediately above excision. Right paramere similarly excised except that excision is somewhat smaller but deeper and the clawlike tip correspondingly longer and more curved below and another correspondingly longer but more blunt protuberance immediately above incision; structure fluted in the rear, the flutations evanescent toward the apices.

FEMALE. Genitalia (pl. 39, no. 12). Subgenital plates about 1 mm. across, attingent on meson, depressed on the sides and partly surrounding the pubic process. Pubic process composed of two stems connate at base, distal portions bent at right angles; the process might be compared to two

riding boots placed back to back and inverted.

Constant in shape, size, degree of glossiness and genital characters. One female specimen observed with the stems of pubic process united throughout and distal portion somewhat involute.

Beetles appear from latter part of March to first of June.

Occurs mostly in the Southeastern States (fig. 32). Not common.



FIGURE 32.—Distribution of *diffinis* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, dogwood, grass, maple, pulse, rose, rue, walnut.

PHYLLOPHAGA TAXODII Langston

Phyllophaga taxodii Langston, 1924, Ent. Soc. Amer. Ann. 17: 449.

Body elongate, color pale yellowish brown, head darker, thorax very slightly darker than elytra, surface moderately shining, female slightly darker than male. Clypeus concave, margin rather widely reflexed, not emarginate, but there is a small sinuation of the reflexed part of the anterior margin. . . . Tarsal claws curved, tooth nearer the base than tip, very small in male, larger in female. Length 12–14 mm.; width one-half the length. (Langston, 31, p. 449.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI feebly flattened; VII eroded on meson and slightly ridged along caudal border. Sternum VIII slightly depressed, the border unindented. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper spur.

Genitalia (pl. 42, nos. 1–4). Apodeme about 2.5 mm. long, posterior portion depressed, the border raised and concave. Phallus symmetrical; phallobase deeply concave anteriorly, broad and flattened. Membranous area ovate. Parameres aborted, depressed in the upper cephalo-lateral borders, provided with short processes at these points; remainder of these borders erose, the parameres ending in short blunt tips; distal opening lenticulate.

FEMALE. Genitalia (pl. 42, no. 5). Subgenital plates about 1.5 mm. wide, attinent anteriorly, widely diverging posteriorly divulging the pubic process above and terminating in somewhat truncate distal extremities. Pubic process platelike, slightly fluted on ventro-meson, emarginate at apex, the apical points rounded.

Constant in all respects.

Beetles appear in June and July.

Taken in Mississippi and Alabama. Not common.

HOST FAMILY. 2—Pine.

PHYLLOPHAGA DEBILIS (LeConte)

Gymnis debilis LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 262.

Phyllophaga debilis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul 11 (art. 5): 373.

Phyllophaga austriicola Fall, 1929, Brooklyn Ent. Soc. Bul 24: 216.

Elongate, cylindrical, pale rufotestaceous, head fuscous; surface moderately shining. Clypeus entire, testaceous, concave, margins rather widely reflexed. Claws feebly arcuate, the tooth small and slightly intramedian. Length 8.5–10.8 mm.

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI rather broadly flattened and dished; VII slightly depressed along posterior border, rugose on the sides. Sternum VIII depressed on meson, posterior border concave. Antennal club about as long as stem. Lower spur of hind tibia unarticulated, about two-thirds as long as upper.

Genitalia (pl. 38, nos. 5–8). Apodeme about 2 mm. long, posterior portion slightly depressed, the end

moderately concave. Phallus symmetrical, deeply concave on dorsum, producing narrow phallobase. Membranous area broadly ovate. Parameres: anterior portion laterally depressed, posterior rounded, bidentate on the inner lower borders, ending in truncate tips; attingent on the ventro-meson; distal opening circular.

FEMALE. The posterior border of sternum VIII slightly concave.

Genitalia (pl. 38, no. 9). Subgenital plates about 1 mm. across, unsculptured, attingent on meson, obtuse at their distal extremities; pubic process platelike, somewhat constricted in the middle, distal portion deeply emarginate producing a bifurcate apex; ventro-meson somewhat fluted.

Constant in all respects.

Beetles appear from May to June.

Taken in Southeastern States and New Jersey (fig. 33). Not common.



FIGURE 33.—Distribution of *debilis* in the United States.

PHYLLOPHAGA AFFABILIS (Horn)

Lachnosterna affabilis Horn, 1887, Amer. Ent. Soc. Trans. 14: 283.

Phyllophaga affabilis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, subcylindrical, rufotestaceous, surface shining. Head moderately broad, darker in color. Clypeus feebly but distinctly emarginate, margin moderately reflexed. . . . Claws feebly curved, the tooth small and very near the base in the male. Length 0.61 inch; 15 mm. (Horn, 27, p. 283.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV—

VI broadly flattened; VII somewhat rounded on meson, rugose on sides. Sternum VIII slightly depressed on the meson near the truncate posterior border. Antennal club about as long as the stem. The lower spur of hind tibia aborted, obtuse, articulated; the upper spur rather long, slender, and acute.

Genitalia (pl. 43, nos. 1–4). Apodeme about 4 mm. long, the posterior portion slightly flattened and fluted on meson, the border concave. Phallus symmetrical; phallobase rather broad, depressed along anterior border. Parameres depressed and somewhat excised on lower anterior borders, deeply depressed on lateral sides, caudal border flattened and long extended forming elongate, flat, thin, reflexed, usually round though sometimes obtuse pointed apices; distal opening ovate.

FEMALE. Sternum VIII rounded, the posterior border slightly concave.

Genitalia (pl. 43, no. 5). Subgenital plates about 2 mm. across, attingent on meson, slightly diverging posteriorly, with slight depressions near distal ends. Pubic process platelike, the distal extremity with a deep excision almost severing the plate into two equal parts.

Usually constant, sometimes slight variation in tips of male genitalia.

Beetles are active from July to August.

Taken in South-Central States west of Mississippi River (fig. 34). Not abundant.

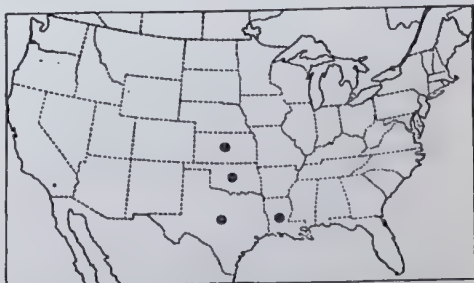


FIGURE 34.—Distribution of *affabilis* in the United States.

PHYLLOPHAGA DAVISI Langston

Phyllophaga davisii Langston, 1927, Ent. Soc. Amer. Ann. 20: 221.

Body oblong-oval, widest about middle of elytra, color chestnut brown, head slightly darker, some specimens with head and thorax darker, female slightly darker than the male, surface shining. Clypeus concave, margin narrowly reflexed, very slightly emarginate . . . Tarsal claws curved, tooth small and intramedian in the male, larger and median in the female. Length 11-12 mm.; width 5.5-6 mm. (Langston, 33, p. 221.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV-VI rounded; VII arcuately ridged with a granulose depression behind. Sternum VIII flattened on meson, the area granulose, the posterior border truncate, entire. Antennal club only about two-thirds as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper. Both spurs hyaline margined near tips.

Genitalia (pl. 35, nos. 1-4). Apodeme about 2 mm. long, the posterior portion transversely constricted, the border slightly convex. Phallus symmetrical; phallobase broad. Parameres aborted, united on ventrum producing a tubular phallic structure; rounded on dorsum, flattened on venter; distal opening ovate.

FEMALE. Genitalia (pl. 35, no. 5). Pubic process placoid with a large V-shaped emargination at the distal end, elevated along the longitudinal axis and conspicuously depressed on either side of elevation.

Only a few specimens seen. Beetles appear in April.

Taken in Mississippi and Alabama. Rare.

Host family. 2—Beech.

PHYLLOPHAGA YOUNGI Cartwright

Phyllophaga youngi Cartwright, 1935, Ent. News, 46: 102.

Elongate oblong. Head dark castaneous, pronotum ferruginous, elytra, ferruginotestaceous at base, shading quickly to testaceous, abdomen testaceous, legs ferruginous, the tibia darker. Upper surface shin-

ing, glabrous. Antennae 9-jointed . . . Clypeus moderately emarginate, sides arcuate; margin broadly not abruptly reflexed . . . Tooth of claw median, strong, right angled. Length 16.5 mm., width 8 mm. Type ♂. (Cartwright, 6, p. 102.)

MALE. Mesal region of sterna IV-VI rounded, dilated; VII regular or unsculptured except depressed along the posterior border. Sternum VIII very narrow, unsculptured, the posterior border regular. Antennal club less than one-half as long as stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper. Both spurs slender and obtuse.

Genitalia (pl. 44, nos. 1-5). Apodeme about 4 mm. long, posterior portion slightly depressed on sides, the border pulvinate. Phallus symmetrical; phallobase broad. Parameres rather long extended laterad, terminating in hamate tips pointing caudo-mesad, adorned at the outer base with a short tooth on either side. Aedeagus adorned with a brushlike accessory and a heavily chitinized twisted tubular structure flared at the tip.

FEMALE. Genitalia (pl. 44, no. 6). Subgenital plates 1.5 mm. wide, concave, unsculptured, attinent narrowly in the middle, very widely diverging anteriorly, less so posteriorly, ending obtusely in distal extremities. Pubic process much aborted, consisting only of a narrow chitinized structure somewhat tuberculate on either side of the middle and almost concealed above the plates.

This species is different from any other of its genus and apparently belongs to the West Indian fauna.

Adults appear in June and July.

Occurs only in southern Florida. Rare.

PHYLLOPHAGA INEPTA (Horn)

Lachnosterna inepta Horn, 1887, Amer. Ent. Soc. Trans. 14: 282.

Phyllophaga inepta, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, subcylindrical, rufotestaceous, shining. Clypeus emarginate, the border narrowly reflexed . . . Claws curved, the tooth large and median in the male.

Length 0.60 inch; 15 mm. (Horn, 27, p. 282.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV-VI feebly flattened and granulose; VII depressed with a large rounded diagonal tuberculate protuberance on either side, the elevations and inner face granulose. Sternum VIII slightly depressed, the border usually regular sometimes slightly concave. Antennal club shorter than the stem. Lower spur of hind tibia articulated, not quite so long as the upper spur. Both spurs slender and acute.

Genitalia (pl. 45, nos. 4-7). Apodeme about 2 mm. long, posterior portion flattened, slightly depressed, the border slightly convex. Phallus symmetrical, tubular; phallobase very broadly united and flattened, narrower cephalad than caudal. Parameres aborted, fused on venter and long extended, terminating in a bidentate tip; distal opening circular; phallic structure almost at right angles with apodeme.

FEMALE. Genitalia (pl. 45, nos. 8 and 9). Subgenital plates about 1.5 mm. wide, attinent throughout on dorsum, distal extremities either round or somewhat truncate partially surrounding and partially eclipsing the pubic process above; genital structure in provimal region on sides and venter supplied with a rather wide chitinized structure. Pubic process a squarish platelike structure somewhat excised on the sides near

base, deeply and rather broadly depressed on the meson, roundly emarginate in the distal extremity, and either rounded or truncate on either side of the emargination.

Constant in all respects.

Beetles appear from May to July.

Taken mainly in central Mississippi valley area (fig. 35). Not abundant.

PHYLLOPHAGA IMPLICITA (Horn)

Lachnosterna implicita Horn, 1887, Amer.

Ent. Soc. Trans. 14: 262.

Lachnosterna minor Linell, 1896, U. S.

Natl. Mus. Proc. 18: 728.

Phyllophaga implicita, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 373.

Phyllophaga linelli Saylor, 1937, Rev. de Ent. 7 (2-3): 321.

Oblong-oval, convex, rufotestaceous to brown, head and thorax always darker, moderately shining. Clypeus moderately deeply, acutely emarginate, the border moderately reflexed. . . . Claws arcuate, a small acute median tooth ♂, larger in ♀. Length 0.55-0.68 inch; 14-17.5 mm. (Horn, 27, p. 262.)

Antennae 9-segmented.

MALE. (pl. 5, no. 5). Mesal region of sterna IV-VI broadly flattened and dished; VII conspicuously, transversely, arcuately ridged, the ridge somewhat tuberculate on the sides; area behind ridge cupuliform and granulose. Sternum VIII feebly depressed on meson, posterior border undulating, sometimes concave (pl. 9, no. 6). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, obtuse, slightly curved and about one-half as long as the straight acute upper spur (pl. 1, no. 10).

Genitalia (pl. 46, nos. 1-5). Apodeme about 3.5 mm. long, posterior portion slightly depressed, with a low ridge on meson, the border angularly excised. Phallus asymmetrical; phallobase prominently rounded on dorsum, the subdorsal borders sloping. Left paramere rounded in the upper caudo-lateral area, keeled in the lower lateral area, excised on the upper caudal border terminating



FIGURE 35.—Distribution of *inepta* in the United States.

into an acute hamate tip. Right paramere keeled in lateral area fluted in caudal area, rather deeply excised on the lower cephalo-lateral region forming the acute hamate tip caudad and a short round protuberance cephalad of excision; upper caudal border excised similarly as that of left paramere.

FEMALE. Sternum VIII slightly concave on posterior border.

Genitalia (pl. 46, no. 6). Subgenital plates about 2 mm. across, attingent on meson, slightly diverging anteriorly somewhat less so posteriorly, somewhat depressed on the sides of the truncate distal ends. Pubic process, platelike, triangular in outline, with basal angles distad; emarginate in middle of distal extremity; ventro-meson depressed.

Variable in color from light brown to almost black, genitalia of female constant. Male phallic structure somewhat variable, sometimes both parameres are fluted in the rear.

Beetles appear from March to mid-July. Taken mostly in Mississippi and Ohio Valleys (fig. 36). Very common in some sections.

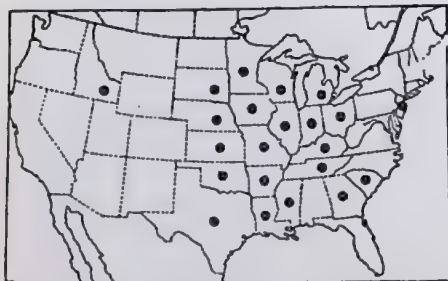


FIGURE 36.—Distribution of *implicita* in the United States.

HOST FAMILIES. 2—Beech, dogwood, ebony, elm, planetree, pulse, rose, tupelo, walnut, willow. 3—Basswood, beech, birch, ebony, elm, honeysuckle, maple, planetree, pulse, rose, walnut, willow.

PHYLLOPHAGA SOROR Davis

Phyllophaga soror Davis, 1920, Ill. Nat. Hist. Survey Bul. 13 (art. 12): 333.

Body oblong, rufotestaceous or darker, the thorax usually more of a reddish brown, with the head darker, surface moderately shining. Clypeus broadly emarginate, margin moderately reflexed. . . . Claws with tooth of moderate size and basal in male (pl. 1, no. 17); larger and median in female. Length 13–15 mm. (Davis, 12, p. 333.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI slightly dishd; VII granular with sides slightly rugose. Sternum VIII with a cupuliform, smooth concavity and rounded posterior border. Antennal club somewhat shorter than the stem. Lower spur of hind tibia obtuse, unarticulated and about one-half as long as the acute upper spur.

Genitalia (pl. 46, nos. 7–11). Apodeme about 3 mm. long, slightly depressed on the dorsum of the posterior portion, the border concave. Phallus symmetrical, deeply excised in cephalo-dorsal region producing narrow phallobase. Membranous area somewhat oval in outline. Parameres conspicuously rounded in the caudolateral area, the border involute on the venter, forming cordate distal opening; deeply constricted anteriorly on the venter forming broadly rounded tips cephalad to the constriction.

FEMALE. Genitalia (pl. 46, no. 12). Subgenital plates about 2 mm. across, attingent on meson, distal ends sharp-angled. Pubic process composed of a thin plate somewhat lyrate in outline, somewhat depressed on the meson, deeply emarginate in



FIGURE 37.—Distribution of *soror* in the United States.

distal region, the excision V-shaped and producing a bidentate tip.

Constant in superficial characters and in genital structure.

Adults appear in June and July.

Taken in some of the southeastern States (fig. 37). Fairly abundant.

HOST FAMILY. 2—Rose.

PHYLLOPHAGA LONGITARSA (Say)

Melolontha longitarsa Say, 1824, Acad. Nat. Sci. Phila. Jour. 3 (2): 241.

Trichestes longitarsis, Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 359.

Lachnosterna longitarsis, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 240.

Lachnosterna frontalis LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 239.

Phyllophaga longitarsa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Slender, elongate, cylindrical, pale yellowish testaceous, front fuscous or piceous; surface moderately shining. Clypeus concave, deeply emarginate (pl. 2, no. 22)... Claws feebly curved ♂ and with a small acute tooth near the base, the ♀ claw more arcuate, the tooth stronger and median. Length 0.41–0.52 inch; 10.5–13 mm. (Horn, 27, p. 226.)

Antennae 9-segmented.

MALE. Mesal region of sterna IV–VI broadly flattened, slightly dished; VII slightly depressed and granulose along the deeply concave posterior border. Sternum VIII slightly depressed, the caudal border unindented. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, very short usually less than one-half the length of the slender upper spur.

Genitalia (pl. 47, nos. 1–4). Apodeme about 2.5 mm. long, posterior portion broadly depressed, the end pulvinate. Phallus symmetrical; phallobase narrow. Parameres conchate, depressed along the lower anterior region, attenuate ventrad, terminating in short pointed apices; distal opening oblong ovate.

FEMALE. Genitalia (pl. 47, no. 5). Subgenital plates about 1.5 mm. across, rounded, attinent, on meson, depressed at distal ends. Pubic process arising from between the de-

pressed areas, composed of two short thin somewhat pliant, inconspicuous stems.

Constant in all respects.

Adults appear from the middle of May to the middle of July.

Taken mostly in central part of United States (fig. 38). Common in some districts.



FIGURE 38.—Distribution of *longitarsa* in the United States.

PHYLLOPHAGA NITIDA (LeConte)

Lachnosterna nitida LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 256.

Lachnosterna limula Horn, 1887, Amer. Ent. Soc. Trans. 14: 264.

Lachnosterna inominata Smith, 1889, Ent. Amer. 5: 98.

Phyllophaga nitida, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, nearly parallel, convex, dark brown, very shining as if varnished. Clypeus moderately deeply emarginate, the margin reflexed... Claws arcuate, the tooth long, strong and median. Length 0.80–0.82 inch; 20.5–21 mm. (Horn, 27, p. 265.)

Antennae 9-segmented.

MALE. (pl. 4, no. 2). Mesal region of sterna IV–VI broadly flattened, slightly dished; VII with a rounded, sometimes angular ridge on either side of granulose meson. Sternum VIII deeply depressed on meson, the posterior border unindented. Antennal club about as long as the stem. The lower spur of hind tibia unarticulated, about two-thirds as long as the more slender upper spur.

Genitalia (pl. 44, nos. 7–11). Apodeme about 4.5 mm. long, posterior portion slightly depressed, the border raised and angularly excised.

Phallus asymmetrical; phallobase narrow and collarlike. Left paramere broadly but narrowly involute on the cephalo-lateral border, involute on caudo-lateral border terminating into an acutish tip bent cephalad; mid-inner face supplied with a short blunt process pointing caudo-mesad. Right paramere more deeply involute on the cephalo-lateral border than left paramere, with a heeled process above, only slightly involute on caudo-lateral border and terminating in a shorter pointed tip than that of left paramere; mid-inner face also supplied with a blunt process but larger than that of the left paramere.

FEMALE. Genitalia (pl. 44, no. 12). Subgenital plates about 2 mm. long, attigent on meson, truncate at distal extremity, depressed on sides in distal region. Pubic process composed of a broad flat basal or proximal portion and two short, diverging flat thin stems, truncate at the apices; process sometimes bent dorsad at right angles to plates.

Fairly constant in most respects, sometimes surface dull instead of glossy as is usually the case. No appreciable variation in genitalia.

Beetles active from first of April to middle of July.

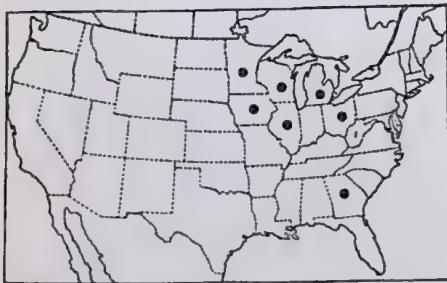


FIGURE 39.—Distribution of *nitida* in the United States.

Taken mostly in several of the north-central states (fig. 39), and in several of the Canadian provinces (fig. 40). Not common.



FIGURE 40.—Distribution of *nitida* in Canada.

HOST FAMILIES. 3—Birch, beech, dogwood, elm, rose, rue, walnut, willow, witchhazel. Canada—Willow.

PHYLLOPHAGA BALIA (Say)

Melolontha balia Say, 1825, Acad. Nat. Sci. Phila. Jour. 5 (1): 194.

Lachnosterna balia, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 255.

Ancylonycha comata Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 337.

Phyllophaga balia, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, distinctly broader behind, brown, head and thorax slightly darker than the elytra, surface moderately shining. Clypeus broadly not deeply emarginate, margin narrowly reflexed. Claws curved, the tooth strong and median. Length 0.60–0.64 inch; 15–16 mm. (Horn, 27, p. 262.)

Antennae 9-segmented.

MALE. (pl. 5, no. 9). Mesal region of sterna IV–VI broadly flattened; VII transversely arcuately ridged, the ridge broad and granulose. Sternum VIII roundly depressed, the posterior border pulvinate. Antennal club as long as the stem. Lower spur of hind tibia about two-thirds as long as upper, unarticulated.

Genitalia (pl. 48, nos. 1–5). Apodeme about 3 mm. long, posterior region depressed, the slightly concave border somewhat elevated. Phallus asymmetrical; phallobase narrow, collarlike. Left paramere somewhat conchate, cephalic region depressed, the border excised and somewhat invaginated forming an obtuse tip; lower inner face adorned with a fluted prominence extending distad. Right paramere smaller than left,

somewhat conchate, the cephalic region depressed, the border excised and invaginated, forming the clawlike tip caudad and a rounded lobelike portion cephalad of excision, which is practically wanting in left paramere; lower inner face adorned with a stemlike curved prominence, extending caudad and terminating in an acutish apex.

FEMALE. Genitalia (pl. 48, no. 6). Subgenital plates about 1.5 mm. long, attingent on meson, greatly depressed in the posterior region forming a broad ledge from which pubic process originates. Pubic process composed of a narrow proximal portion and two widely diverging distal stems terminating in either rounded or truncate apices. In outline process resembles letter Y.

Male phallic organ constant but pubic process of female genitalia varies in size and somewhat in form. Resembles *hirsuta* in genital characters but can be distinguished from that species in being more elongate in form, and having no vestiture.

Beetles appear from April through the middle of July.

Taken mostly in the north-central area of United States (fig. 41). Also one specimen taken in one of the Canadian provinces.



FIGURE 41.—Distribution of *balia* in the United States.

HOST FAMILIES. 2—Beech, walnut. 3—Beech, birch, elm, laurel, maple, rose, walnut, willow, witchhazel.

PHYLLOPHAGA HETERODOXA (Horn)

Lachnosterna heterodoxa Horn, 1887, Amer. Ent. Soc. Trans. 14: 289.
Phyllophaga heterodoxa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, pale rufotestaceous, head and thorax slightly darker, surface very glossy. Clypeus subtruncate, faintly sinuate at middle, margin moderately widely reflexed. . . . Claws dissimilar in the sexes. Length 0.56 inch; 14 mm. (Horn, 27, p. 289.)

Antennae 10-segmented.

MALE. Mesal region of sterna V and VI markedly depressed; VII fluted. Sternum VIII fluted on meson, the posterior border entire. Antennal club somewhat longer than the stem. Spurs of hind tibia about of equal length, articulated, slender and acute.

Genitalia (pl. 42, nos. 6 and 7; pl. 47, no. 11). Apodeme about 3 mm. long, the posterior border only slightly emarginate. Phallus symmetrical; phallobase very narrow. Parameres aborted, narrow, rather short extended distad and merged into an obtuse tip. Aedeagus chitinized and somewhat protruding.

FEMALE. Genitalia. Subgenital plates about 2 mm. across, incised in the distal regions producing flaps, which extend almost to the more heavily chitinized distal margins. Pubic process wanting.

Adults appear in June.

Taken only in Arizona. Rare.

PHYLLOPHAGA ERRANS (LeConte)

Lachnosterna errans LeConte, 1860, Acad. Nat. Sci. Phila. Proc. 11: 283.
Phyllophaga errans, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oval, slightly oblong, moderately robust, rufocastaneous to brown, shining. Clypeus very nearly entire, concave, the border rather widely reflexed. . . . Claws curved, the tooth median, small ♂, strong ♀. Length 0.60–0.75 inch; 15–19 mm. (Horn, 27, p. 240).

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI flattened; VII with a transverse arcuate ridge, more pronounced and

sheer on the sides, depressed and somewhat granulose behind. Sternum VIII smooth on meson, sides ridged, the posterior border slightly concave. Antennal club about as long as the stem. Lower spur unarticulated and about two-thirds as long as the upper spur. Both spurs slender.

Genitalia (pl. 49, nos. 1-4). Apodeme about 4 mm. long with a longitudinal ridge on meson of posterior portion, somewhat depressed on either side, the depression extending laterally along the ridged border, posterior border slightly concave. Phallus almost symmetrical; phallobase narrow, collarlike. Parameres well developed, slightly involute in the upper portion of the outer faces, fluted in the rear, the flutings extending to the terminals. Lower inner borders somewhat extended forming short protuberances pointing centrad; latero-ventral areas deeply depressed; distal opening circular.

FEMALE. Sternum VIII with a lunate incised area on posterior border.

Genitalia (pl. 49, no. 5). Subgenital plates about 4 mm. across, attigent on meson, posterior portion depressed on either side of the process forming auriculate cavities. Pubic process narrow at point of origin, widening out into a broad apical portion; moderate incision in the middle of apical portion and narrow ridge from base of incision extend-

ing anteriorly but evanescent before reaching the base.

Constant in all respects including genital characters.

Adults appear in May and June.

Occurs in Washington, Oregon, and California. Not common (fig. 42).

Phyllophaga sequoiana Saylor (60, pp. 2-4) (pl. 6, no. 4).

Body as *errans* in shape, color, size except subtruncate clypeus. (pl. 2, no. 21). Slight variation in phallic structure (pl. 49, nos. 6-8♂, no. 9♀). Protuberances on inner border accentuated by rounded incisions immediately below. These incisions lacking in *errans*. Taken in California.

PHYLLOPHAGA FARCTA (LeConte)

Lachnosterna farcta LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 238.

Phyllophaga farcta, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Ovate, convex facies robust, rufocastaneous, dark brown or piceous, moderately shining. Body feebly winged in both sexes. Clypeus feebly sinuate, border reflexed, more widely in front . . . Claws moderately arcuate, the tooth intramedian in both sexes (pl. 2, no. 16), and acute, longer in the female. Length 0.72-0.97 inch; 18-24.5 mm. (Horn, 27, p. 218.)

Antennae 10-segmented.

MALE. (pl. 7, no. 10). Mesal region of sterna IV-VI broadly flattened; VII with a papillose area. Sternum VIII unsculptured, posterior border entire. Antennal club not quite so long as the stem. Lower spur of hind tibia broad, truncate, articulated, about one-half as long as the narrower upper spur which bears a translucent border (pl. 1, no. 7).

Genitalia (pl. 30, nos. 1-3). Apodeme about 7 mm. long, posterior portion broadly flattened on dorsum, the sides depressed, the border markedly concave. Phallus symmetrical; phallobase narrow. Parameres depressed on sides, well developed, attenuate into long extended flat ob-



FIGURE 42.—Distribution of *errans* in the United States.

tuse apices; distal portions somewhat twisted mesad, the opening oblong oval.

FEMALE. Genitalia (pl. 30, no. 4). Subgenital plates about 4 mm. wide, attinent in posterior regions, somewhat diverging anteriorly, somewhat depressed on sides of distal portions, and obtusely rounded at distal extremities. Pubic process a simple squarish fluted plate, with an angular emarginate distal extremity most always almost completely hidden from view by genital plates.



FIGURE 43.—Distribution of *farcta* in the United States.

Constant in all respects.

Adults appear in May and June.

Taken mostly from the south-central region west of the Mississippi (fig. 43). Not abundant.

HOST FAMILY. 2—Elm.

PHYLLOPHAGA CRIBROSA (LeConte)

Lachnosterna cribrosa LeConte, 1853, Acad. Nat. Sci. Phila. Proc. 6: 231.

Lachnosterna ventricosa LeConte, 1854, Acad. Nat. Sci. Phila. Proc. 6: 440.

Phyllophaga cribrosa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Broadly ovate and convex, piceous black, shining. Clypeus feebly sinuate, margin narrowly reflexed . . . Claws arcuate, a moderately long acute tooth near the base in both sexes. Length 0.65–0.90 inch; 16.5–23 mm. (Horn, 27, p. 217.)

Antennae 10-segmented.

MALE. (pl. 7, no. 12). Mesal region of sterna IV–VI flattened, somewhat fluted, the channel extending to the posterior region of VII,

ending at the transverse feeble channel on this segment; VIII unsculptured (pl. 10, no. 11). Antennal club much shorter than stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper.

Genitalia (pl. 30, nos. 5–8). Apodeme about 6 mm. long, posterior portion broadly flattened, the end angular concave. Phallus symmetrical, tubular; phallobase narrow. Parameres aborted, united on venter, forming an obtuse tip bent cephalad; short toothed on inner lower caudal border; distal opening oblong oval.

FEMALE. Genitalia (pl. 30, no. 9). Subgenital plates about 4 mm. long, attinent on meson, slightly depressed on sides of the distal portions, distal ends undulating. Pubic process composed of a narrow plate, very broad, and usually sculptured with depressions; distal end undulating.

Constant in all respects.

Beetles appear from middle of March to middle of June.

Taken mostly in Texas and two neighboring States (fig. 44). Abundant in the Texas region and often a serious pest of crops.

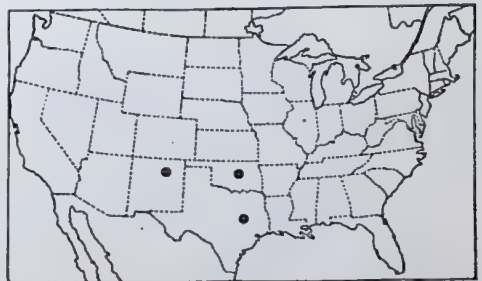


FIGURE 44.—Distribution of *cribrosa* in the United States.

HOST FAMILY. 2—Grass.

Phyllophaga zavalana Reinhard (50, pp. 69–70).

Small form, wholly black, inner lower caudal border of merged parameres smooth, without teeth. Known only from Texas.

Phyllophaga renodis Reinhard (48, pp. 48-49) (pl. 15, nos. 1-4 ♂).

Small form, reddish brown, smooth tooth of claw nearly intramedian. Taken only in central Texas.

PHYLLOPHAGA EPIGOEA (Wickham)

Lachnosterna epigoea Wickham, 1903, Canad. Ent. 35: 71.

Phyllophaga epigoea, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Subovate, obtuse behind, convex, nearly black, slightly shining. Clypeus barely perceptibly emarginate in front in the male, more distinctly so in the female, margin reflexed. . . . Legs stout, claws arcuate. Length 12.5-14 mm. (Wickham, 77, p. 71.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI slightly dished; VII with a few diagonal striae on the sides. Sternum VIII extremely narrow with a ridge along the cephalic border. Antennal club about two-thirds as long as the stem. Lower spur of hind tibia, articulated, and two-thirds as long as upper spur. Both spurs slender and acute.

Genitalia (pl. 47, nos. 6-9). Apodeme about 2.5 mm. long, flattened on the meson of the posterior region, the border slightly concave. Phallus symmetrical; phallobase narrow. Parameres aborted, united on venter, projected caudally and forming an obtuse tip, pointing somewhat cephalad; distal opening somewhat circular.

FEMALE. Abdomen dilated; sternum VII slightly depressed along posterior border with a small rugose area on either side.

Genitalia (pl. 47, no. 10). Subgenital plates about 2 mm. wide on the meson, widely separated in the anterior region, converging gradually becoming attingent in posterior region. Pubic process composed of two short diverging stems and connective tissue, concealed above plates, only apices protruding.

A stable species, uniform in color, size, and genital characters.

Beetles appear in July.
Occurs in Texas. Rare.

PHYLLOPHAGA ELIZORIA Saylor

Phyllophaga elizoria Saylor, 1937, Rev. de Ent. 7 (2-3): 321.

Lachnosterna pygidialis Schaeffer, 1906, Amer. Ent. Soc. Trans. 32: 257.

Oblong, broader behind, brown, shining. Clypeus flat, margin very feebly reflexed, apex distinctly emarginate. . . . Claws feebly curved, the tooth small and nearer the base than the middle. Length 17 mm. (Schaeffer, 66, p. 257.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI feebly flattened; VII feebly depressed, the area granulose. Sternum VIII narrow, slightly depressed, the posterior border somewhat truncate. Antennal club about as long as the stem. The lower spur of hind tibia about as long and wide as the upper spur. Both spurs articulated, acutish and hyaline margined.

Genitalia (pl. 22, nos. 5 and 6). Apodeme about 3 mm. long, posterior portion flattened, the border slightly emarginate. Phallus symmetrical, at right angles to apodeme; phallobase extremely broad, depressed in the subdorsal areas. Parameres aborted, united on venter, terminating in a bifurcate apex; distal opening narrowly ovate.

FEMALE unknown.

Beetles taken in Florida and Texas.

PHYLLOPHAGA PSILOPTERA

Sanderson

Phyllophaga psiLOPTERA Sanderson, 1939, Kans. Ent. Soc. Jour. 12: 7.

Form elongate, subcylindrical though somewhat wider behind. Color dark reddish-brown. Body above glabrous. Antennae 10-segmented. . . . Clypeus slightly though distinctly emarginate with the margins moderately reflexed on each side of middle. Length 15-16 mm.; width, 8 mm. (Sanderson, 55, p. 7.)

Mesal region of IV-VI slightly impressed, VII with a V-shaped impression interior of which is papillose. Sternum VIII slightly depressed, the border entire and rounded. Antennal club about two-thirds as

long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper spur; both spurs slender and acutish.

Genitalia (pl. 16, nos. 1-4). Apodeme about 3 mm. long, the posterior portion rounded, unsculptured except longitudinal impression on mesal line. Posterior border of apodeme very deeply emarginate. Phallus symmetrical; phallobase very broad, sharply ridged on meson. Parameres somewhat aborted, deeply and narrowly incised on the lower caudal border, the incisions extending across the lobes; above incisions, borders are flanged; below incisions, borders are rounded producing rounded paramere apices. Aedeagus long, slender, and strongly chitinized.

Beetles appear during July.

Taken only in Texas. Rare.

PHYLLOPHAGA TORTA (LeConte)

Lachnosterna torta LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 239.

Phyllophaga torta, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, slightly broader posteriorly, convex, facies rather robust, reddish-brown, moderately shining. Clypeus distinctly emarginate, the margin reflexed. . . . Claws strongly arcuate, the tooth smaller and intramedian ♂, larger and median ♀. Length 0.75-0.96 inch; 19-24 mm. (Horn, 27, p. 219.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI rather broadly flattened; VII with an arcuate granulose elevation along posterior border. Sternum VIII erose with posterior border slightly elevated and concave, sometimes feebly emarginate on meson. Antennal club about as long as the stem. Lower spur, articulated, hamate, truncate, about two times as long as the upper obtuse wedge-shaped spur (pl. 1, no. 4).

Genitalia (pl. 50, nos. 1-5). Apodeme about 4 mm. long, posterior region broadly transversely depressed, longitudinally fluted on meson, posterior border moderately concave.

Phallus symmetrical; phallobase concave in the cephalo-dorsal region, narrow. Membranous area somewhat ovate. Parameres with lower cephalo-lateral regions depressed, lower caudo-lateral regions also depressed and roundly excised producing clawlike apices, with claws twisted, outer claws truncate pointing outward, inner acutish and pointing cephalomesad; distal opening somewhat U-shaped.

FEMALE. Genitalia (pl. 50, no. 6). Subgenital plates about 3 mm. across, attinent on meson, truncate at distal extremities, sometimes slightly depressed on the sides of the distal areas. Pubic process a triangular plate with apex cephalad, rounded at outer angles narrowly but broadly emarginate on distal border and fluted on venter.

Fairly constant in all respects, slight variation in color from reddish brown to dark reddish brown. Pubic process of female genitalia sometimes without emargination, the border undulating.

Beetles appear from latter part of April to middle of July.

Taken in south-central part of the United States (fig. 45). Fairly abundant.

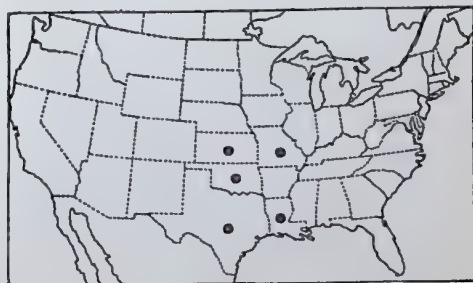


FIGURE 45.—Distribution of *torta* in the United States.

HOST FAMILIES. 2—Elm, rose.

PHYLLOPHAGA EPHILIDA (Say)

Melolontha ephilida Say, 1825, Acad. Nat. Sci. Phila. Jour. 5 (1): 196.

Lachnosterna ephilida, Horn, 1887, Amer. Ent. Soc. Trans. 14: 225.

Lachnosterna burmeisteri LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 242.

Phyllophaga ephilida, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Moderately elongate, cylindrical, rufo-testaceous, the head and thorax usually darker; surface moderately shining. Clypeus broadly emarginate, the border reflexed. . . . Claws with moderate size tooth, intramedian ♂, longer and more nearly median ♀. Length 0.55–0.75 inch; 14–19 mm. (Horn, 27, p. 225.)

Antennae 10-segmented.

MALE. (pl. 4, no. 3). Mesal region of sterna IV–VI flattened; VII with a lunate, granulose depression in the posterior area, the border raised and usually very dark. Sternum VIII markedly depressed, broadly emarginate on caudal border, with a short protuberance on each side of emargination, base of emargination ridged and very dark (pl. 9, no. 3). Antennal club about as long as the stem. Lower spur of hind tibia short, stubby, and unarticulated, about one-sixth as long as the slender upper spur (pl. 1, no. 13).

Genitalia (pl. 51, nos. 1–3). Apodeme about 4 mm. long, transversely markedly depressed in the posterior region, the border deeply and broadly concave. Phallic structure deeply angularly excised in anterior region, membranous area top-shaped. Phallus, symmetrical; phallobase, broad. Parameres excised sometimes deeply in the upper caudal area forming a bifurcate tip; the upper portions usually the narrower of the two and sometimes touching; laterad, depressed anteriorly forming a recurved lateral and cephalic border and ridged mesal border ending in blunt protuberances.

FEMALE. Genitalia (pl. 51, nos. 6 and 7). Subgenital plates about 2.5 mm. across, small, rounded, unsculptured, attinent in the anterior region diverging widely and ending obtusely posteriorly. Pubic process about 3 mm. long, flat, somewhat constricted at base, widening out

sharply reaching its greatest width at point of exertion, then becoming attenuate and ending in a blunt tip, somewhat bent dorsad; sometimes ridged or keeled on meson.

Constant in form, shape, and color, variable in genital characters, particularly in the male genitalia, excisions in caudal area of parameres sometimes very shallow.

Adults appear in June and July.

Occurs practically throughout eastern half of the United States (fig. 46). Quite common in some sections. Also recorded from Canada but exact location unknown.

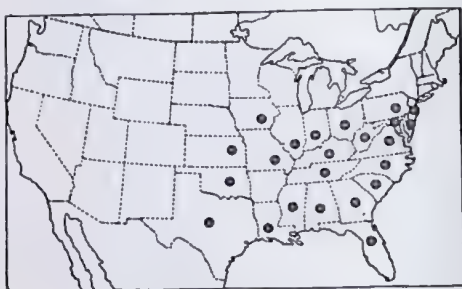


FIGURE 46.—Distribution of *ephilida* in the United States.

HOST FAMILIES. 2—Beech, bignonia, birch, dogwood, ebony, elm, grass, honeysuckle, mallow, olive, pine, planetree, pulse, rose, saxifrage, sumac, tupelo, vine, walnut, willow. 3—Basswood, beech, elm, mulberry, planetree, pulse, rose, walnut.

Phyllophaga ephilidu subsp. *virilis* Reinhard (48, pp. 51–52).

Differing from *ephilida* mainly in phallic characters. In *virilis* parameres are only slightly excised in the caudal area (pl. 51, nos. 4 and 5). In *ephilida* the excisions are usually very deep (pl. 51, nos. 1 and 2). The female genitalia are alike in the two species.

Occurs in Arkansas, Louisiana, and Texas. (fig. 47).

HOST FAMILIES. 2—Beech, elm, vine, walnut.



FIGURE 47.—Distribution of *ephilida* subsp. *virilis* in the United States.

PHYLLOPHAGA ARKANSANA
(Schaeffer)

Lachnosterna arkansana Schaeffer, 1906, Amer. Ent. Soc. Trans. 32: 257.

Lachnosterna lenta Fall, 1908, Ent. News 19: 162.

Phyllophaga arkansana, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Oblong, slightly broader behind, castaneous, shining. Clypeus moderately reflexed, apex distinctly but not deeply emarginate. . . . Antennae 10-jointed. Claws arcuate, with a strong acute tooth at middle. Length 21 mm. (Schaeffer, 66, p. 257.)

MALE. (pl. 8, no. 1). Mesal region of sternum IV–VI dishd; VII transversely crossed in the middle with a granulose arcuate ridge, behind which is a rugose depression; VIII depressed, ridged along the anterior border, broadly emarginate on the posterior border (pl. 10, no. 12). Antennal club about as long as the stem. Lower unarticulated spur of hind tibia less than one-half as long as the upper spur.

Genitalia (pl. 50, nos. 7–10). Apodeme about 5 mm. long with a pronounced longitudinal ridge on the meson of the posterior region and a depression on either side in front of the slightly elevated feebly concave border. Phallus asymmetrical; phallobase very narrow, reduced to a collar. Left paramere narrow, long extended, depressed on the lateral side, the depression extending ventrad toward extremity and producing a right-angled hook somewhat recurvate; inner face somewhat fluted, the border advanced distad imparting a slight twist to hook. Right

paramere deeply excised and depressed in the upper caudal area, the depression extending to lateral side; lower caudo-lateral area deeply excised forming an angular hook somewhat recurvate. Caudal border somewhat involted.

FEMALE. Mesal region of sternum VII sometimes with rugose areas on the sides, deeply and roundly impressed on the meson of the caudal border of sternum VIII.

Genitalia (pl. 50, no. 11). Subgenital plates about 2 mm. across, attingent on meson, deeply transversely depressed slightly beyond the middle; distal portion with auriculate concavities on the sides. Pubic process composed of a thick stem originating from the posterior margin of the depression, emarginate at apex producing a bifurcate tip.

Fairly constant in superficial and genital characters.

Beetles active from latter part of March to early June.

Taken in many points of the United States, particularly in the southern part (fig. 48). Not common.

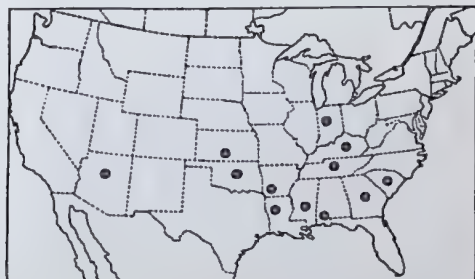


FIGURE 48.—Distribution of *arkansana* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, laurel, mahogany, olive, rose, tupelo, walnut, witchhazel. 3—Elm.

PHYLLOPHAGA INVERSA (Horn)

Lachnosterna inversa Horn, 1887, Amer. Ent. Soc. Trans. 14: 241.

Phyllophaga inversa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, scarcely broader behind, rufocastaneous to brown, moderately shin-

ing. Clypeus very feebly emarginate, the border moderately reflexed . . . Claws curved, the tooth median, not large, ♂, larger in ♀. Length 0.60-0.72 inch; 15-18 mm. (Horn, 27, p. 241.)

Antennae 10-segmented.

MALE. (pl. 8, no. 2). Mesal region of sterna IV-VI broadly flattened and dishd; VII with a transverse, low-curved ridge behind which is a cupuliform granulose depression. Sternum VIII depressed narrowly on meson and broadly emarginate and undulating on the posterior border (pl. 10, no. 4). Antennal club about as long as the stem. Lower spur of hind tibia broad, obtuse, unarticulated and about one-half as long as the acute, more slender upper spur.

Genitalia (pl. 52, nos. 1-5). Apodeme about 4 mm. long, posterior region moderately depressed, the slightly concave border slightly raised. Phallus asymmetrical; phallobase very narrow, reduced to a collar. Left paramere slightly excised on the dorso-lateral border, deeply depressed in the cephalic half, deeply invaginated in the lower cephalo-lateral region, rounded then flattened in caudo-lateral region terminating distad in thin obtusely rounded apex. Right paramere slightly excised on the dorso-lateral border, depressed in the upper cephalic region, deeply invaginated in the lower cephalo-lateral region, flattened in caudo-lateral region terminating in a thin recurvate and shorter obtusely rounded apex than that of left paramere.

FEMALE. The posterior border of sternum VIII slightly concave.

Genitalia (pl. 52, nos. 6 and 7). Subgenital plates about 2 mm. long, rounded, attingent in the middle, anteriorly widely diverging, posteriorly on meson deeply depressed on sides, the distal ends deeply but narrowly excavated. Pubic process composed of two curved stems, connate and fused in proximal region, incurvate, attenuate into rounded some-

times truncate, sometimes twisted apices.

Some variation in color from light reddish to dark reddish brown, almost black. Male phallic structure constant. Process of female genitalia sometimes with slender distal stems, then again they are quite broad and only feebly bowed.

Adults appear from latter part of April to latter part of June.

Taken mostly in the north-central area of United States (fig. 49). Common in some sections, and grubs are injurious to crops. In Canada, not abundant and taken only in the province of Ontario.



FIGURE 49.—Distribution of *inversa* in the United States.

HOST FAMILIES. 2—Beech, elm, logania, rose, walnut, willow. 3—Basswood, beech, birch, buckeye, dogwood, elm, honeysuckle, pulse, rose, walnut, willow, witchhazel.

PHYLLOPHAGA CONGRUA (LeConte)

Lachnosterna congrua LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 243.

Phyllophaga congrua, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, moderately robust, rufocastaneous to piceous, shining. Clypeus feebly emarginate, the border moderately reflexed . . . Tarsal claws arcuate, the tooth moderately large, median and acute. Length 0.58-0.75 inch; 15-19 mm. (Horn, 27, p. 232.)

Antennae 10-segmented.

MALE. (pl. 4, no. 9). Mesal region of sterna IV-VI flattened, slightly fluted; VII sharply depressed longitudinally near the posterior border; VIII depressed and with a bilobu-

lar extension of posterior border (pl. 9, no. 8). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about as long as the upper.

Genitalia (pl. 52, nos. 8-11). Apodeme about 3 mm. long, somewhat flattened in the posterior region, the border slightly concave. Phallus symmetrical; phallobase narrowed by a deep angular excision in the cephalic region. Membranous area somewhat triangulate. Paramere aborted, rounded caudo-laterally, long extended anteriorly, converging, markedly depressed and fluted along the anterior border and across the lobes, terminating in short abutting processes; ventral margins with spinose protuberances near distal extremities; distal opening circular.

FEMALE. Posterior border of sternum VIII slightly concave.

Genitalia (pl. 52, nos. 12 and 13). Subgenital plates about 2.5 mm. across, attinent in the middle, diverging anteriorly and more so posteriorly, usually without any sculpture. Pubic process composed of a stout attenuate somewhat recurvate stem, with acutish tip and a fluted ventro-meson, evanescent toward the apex. Constant in all respects, except sometimes somewhat variable in size.

Active from middle of March to middle of July.

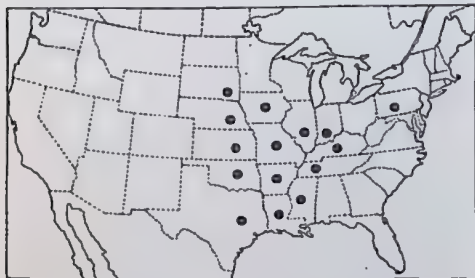


FIGURE 50.—Distribution of *Congrua* in the United States.

Taken mostly in the southern half of the central part of the United States (fig. 50). Quite common in some sections.

HOST FAMILIES. 2—Beech, elm, mulberry, pulse, rose, walnut, willow. 3—Grass, walnut.

PHYLLOPHAGA HIRTIVENTRIS (Horn)

Lachnosterna hirtiventris Horn, 1887, Amer. Ent. Soc. Trans. 14: 231.

Phyllophaga hirtiventris, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly oval, pale castaneous, moderately shining. Clypeus feebly emarginate, margin narrowly reflexed. . . . Claws arcuate, the tooth strong, distinctly in front of middle (pl. 1, no. 15). Length 0.65 inch; 17 mm. (Horn, 27, p. 231.)

Antennae 10-segmented.

MALE. (pl. 4, no. 12). Mesal region of sterna IV-VI dished, visibly fluted; VII sharply narrowly depressed and fluted on meson, granulose on either side. Sternum VIII triangularly depressed, the posterior border conspicuously emarginate on the meson; area about the emargination which includes the entire base of depression, very dark, somewhat advanced and rounded on borders. Antennal club about as long as the stem. Hind tibia with lower spur obtuse, unarticulated, and excavation below at base of spur. Upper spur slightly longer than lower spur, acutish.

Genitalia (pl. 53, nos. 1-4). Apodeme about 3 mm. long, transversely depressed in the posterior region, posterior border concave. Phallus symmetrical, excised in the cephalo-dorsal region, producing a narrow phallobase. Membranous area somewhat circular. Parameres aborted, the caudo-lateral areas rounded and very broad, bell-shaped; cephalo-lateral areas, narrow, rather long extended, converging, depressed, terminating on the venter, with two narrow flat rounded processes abut-

ting at base, but diverging apically; conspicuously fluted on venter; distal opening somewhat ovate.

FEMALE. Genitalia (pl. 53, no. 5). Subgenital plates about 2 mm. across, attingent on meson, unsculptured, distal end truncate. Pubic process bulbous in outline, composed of a broad proximal portion and a narrow attenuate distal portion, slightly emarginate and producing a bidentate tip. Markedly fluted on ventro-meson of basal section but gradually becoming less so apically; depressed on either side of fluted ridge.

Constant in all respects, except a slight variation in color from light to dark reddish brown.

Beetles appear from early April to middle of July.

Taken mostly in south central part of the United States (fig. 51). Common in some sections.



FIGURE 51.—Distribution of *hirtiventris* in the United States.

HOST FAMILIES. 2—Beech, elm, mulberry, pulse, rose, walnut, willow. 3—Elm.

PHYLLOPHAGA PERLONGA Davis

Phyllophaga perlonga Davis, 1920, Ill. Nat. Hist. Survey Bul. 13 (art. 12): 329.

The species is rather large, measuring 22 to 25 mm., with elongate body, rufo-castaneous to almost piceous, thorax shining, elytra dull to moderately shining. Clypeus slightly emarginate, the border moderately reflexed. . . . Claws curved, the tooth median, always noticeably stronger in the female. (Davis, 12, p. 329.)

Antennae 10-segmented.

MALE. (pl. 6, no. 6). Mesal region of sterna IV–VI slightly dished; VII transversely crossed with a granulose arcuate ridge near the caudal border, which is somewhat undermined at the rear on the sides. Sternum VIII slightly depressed, the posterior border undulating. Antennal club about as long as the stem. Lower spur of hind truncate tibia unarticulated, about two-thirds as long as the upper obtuse spur.

Genitalia (pl. 54, nos. 7–11). Apodeme about 8 mm. long, slightly depressed along the concave posterior border. Phallus asymmetrical; phallobase reduced to a collar. Left paramere narrow, extending laterally and ventrally, terminating in a broad, bilobed, twisted apex; slightly fluted in the upper caudal region. Right paramere narrow, with a deep excision in the lower caudo-lateral region producing an inner lobe and an outer broad slightly twisted lobe which is somewhat emarginate near the outer recurvate border; fluted in the caudal region; inner points of apices almost touching.

FEMALE. Genitalia (pl. 54, no. 12). Subgenital plates about 4 mm. across, with anterior portions agape on meson to the transverse deep flutation; distal ends deeply depressed with a ridge dividing depression into two parts. Pubic process composed of a round, slender proximal portion and two round slender diverging distal portions; process resembles somewhat letter Y and arises from the midpoint of the distal portion of the plates.

Constant in superficial characters and genital characters except sometimes slight variation in size and general shape in pubic process of female.

Adults active in April and May.

Taken in several sections in the southern half of the eastern part of the United States (fig. 52). Not common.



FIGURE 52.—Distribution of *perlonga* in the United States.

HOST FAMILIES. 2—Beech, elm, olive, pulse, walnut, willow.

PHYLLOPHAGA POSTREMA (Horn)

Lachnosterna postrema Horn, 1887, Amer. Ent. Soc. Trans. 14: 233.

Lachnosterna quadrata Smith, 1889, Ent. Amer. 5: 94.

Phyllophaga postrema, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, moderately robust, castaneous, shining. Clypeus distinctly emarginate, the margin moderately reflexed . . . Claws feebly curved, the tooth strong and median. Length 0.76 inch; 19 mm. (Horn, 27, p. 233.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI broadly flattened, dished; VII conspicuously transversely ridged along the posterior border, the ridge granulose and rounded in front, precipitous behind, plicate on sides. Sternum VIII broadly depressed, the posterior border undulating. Antennal club almost as long as stem. Lower spur of hind tibia somewhat bowed, unarticulated, and about three-fourths as long as upper spur. Both spurs acutish.

Genitalia (pl. 54, nos. 1–5). Apodeme about 6 mm. long, narrowly depressed along the ridged posterior border, posterior end slightly concave. Phallus almost symmetrical; phallobase very narrow. Left paramere in lower cephalo-lateral and ventral region depressed, in caudo-lateral region rounded, extended ventrad and terminating in a truncate, emarginate extremity, the emargination nearer the depression than caud-

al border and area surrounding it depressed. Right paramere similar to left paramere except depression in cephalo-lateral and ventral region narrower, a wider caudo-lateral region and a correspondingly broader extremity; upper or outer portions of extremities overlapping considerably, usually dark.

FEMALE. Sternum VIII with posterior border rather broadly and deeply concave.

Genitalia (pl. 54, no. 6). Subgenital plates about 4 mm. wide, posterior half deeply transversely depressed producing a ledge, somewhat fluted on either side of the pubic process. Pubic process lyrate, composed of two stems, the proximal portion thick, connate, distal portions widely diverging terminating in rounded apices.

Constant in all respects.

Adults appear in May to early June.

Taken in Southeastern States (fig. 53). Rare.

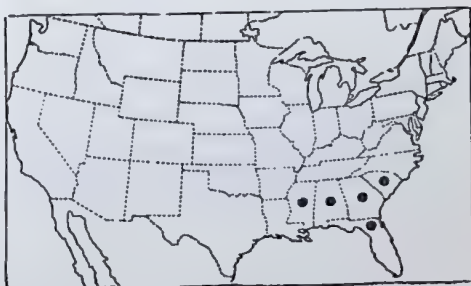


FIGURE 53.—Distribution of *postrema* in the United States.

HOST FAMILIES. 2—Honeysuckle, walnut, willow.

PHYLLOPHAGA HAMATA (Horn)

Lachnosterna hamata Horn, 1887, Amer. Ent. Soc. Trans. 14: 220.

Phyllophaga hamata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly broader behind, rufo-testaceous, thorax darker, head brown; surface shining. Clypeus emarginate, margin narrowly reflexed . . . Claws feebly arcuate, the tooth moderate in size and

intramedian. Length 0.66 inch; 17 mm. (Horn, 27, p. 220.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI slightly flattened; VII with a lunate depression along caudal border. Sternum VIII flattened, the posterior border rounded, unindented. Antennal club about as long as the stem. Lower spur of hind tibia articulated, hamate, obtuse and about one-third longer than the acute upper spur (pl. 1, no. 11).

Genitalia (pl. 55, nos. 1-3). Apodeme about 2.5 mm. long, with a transverse moderately deep depression in the posterior portion and a flattened area adjacent, the border slightly undulating. Phallus symmetrical; phallobase moderately broad and rounded. Parameres, abbreviated due to circular incisions on lower lateral borders, extended, forming rather long, hamate processes caudad and short acute spinose processes cephalad; distal opening represents inverted letter U.

FEMALE. Genitalia (pl. 55, no. 4). Subgenital plates about 2 mm. wide, attinent in the middle, diverging posteriorly, the posterior border roundly emarginate. Pubic process placoid; distal end with a broad V-shaped emargination, somewhat depressed on meson and with a pronounced impression on either side in the proximal region.

Rare. Several specimens from Texas, taken in May and June.

PHYLLOPHAGA GLABRICULA (LeConte)

Lachnosterna glabricula LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser 2): 260.

Phyllophaga glabricula, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, subcylindrical, slightly broader behind, rufotestaceous or slightly darker, surface moderately shining, not iridescent. Head moderately broad. Clypeus emarginate, rather concave, the margin reflexed . . . Claws arcuate, the tooth moderate in size, near the basal dilatation. Length 0.55-0.65 inch; 14-16.5 mm. (Horn, 27, p. 277.)

Antennae 10-segmented.

MALE. (pl. 5, no. 3). Mesal region of sterna IV-VI feebly flattened; VII tuberculate on meson, the tubercle and surrounding area granulo-se, depressed along the posterior border. Sternum VIII broadly depressed, the posterior border unindented. Antennal club not so long as the stem. Spurs of hind tibia about of equal length, slender, acutish, both articulated.

Genitalia (pl. 53, nos. 6-10). Apodeme about 2.5 mm. long, the posterior portion transversely depressed, the border pulvinate. Phallus symmetrical; phallobase narrow. Parameres depressed in the upper caudolateral regions, slightly heeled in the upper lateral areas, terminating into conchate, obtuse apical extremities; distal opening circular.

FEMALE. Genitalia (pl. 53, no. 11). Subgenital plates rounded, about 2 mm. wide, attinent in posterior region. Pubic process placoid, with feeble emargination in the middle of the distal region and slight depression on meson.

Beetles appear from March through July.

Taken in the prairie States of the United States and also in Florida (fig. 54). Not common.

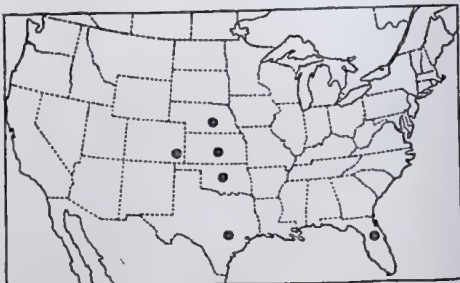


FIGURE 54.—Distribution of *glabricula* in the United States.

PHYLLOPHAGA AUREA Luginbill and Painter

Phyllophaga aurea Luginbill and Painter, 1941, Ent. Soc. Amer. Ann. 34: 716.

Oblong, convex, aureous, moderately polished. Clypeus feebly emarginate, mark-

edly reflexed . . . Elytra dull aureous . . . Antennae 10-jointed. Claws arcuate, the tooth median and stout. Length 12 mm., width 5.9 mm. (Luginbill and Painter, 43, p. 716.)

MALE. (pl. 5, no. 2). Mesal region of sterna IV–VI flattened; VII with posterior portion elevated and rugose; VIII deeply concave, the posterior portion of the concavity adorned with a tuberculate process. Posterior border of VIII undulating. Antennal club somewhat longer than the stem. Lower spur of hind tibia about as long as the upper, articulated.

Genitalia (pl. 55, nos. 5–7). Apodeme about 3 mm. long, the posterior portion depressed on each side of meson, the border deeply concave. Phallus symmetrical; phallobase narrowed by a deep excision of anterior region; membranous area somewhat oval. Parameres aborted, each with a dentate process in the postero-ventral region and bifid truncate apex in the antero-ventral region.

FEMALE. Sterna unsculptured.

Genitalia (pl. 55, nos. 8 and 9). Subgenital plates about 2.5 mm. across, attingent in the middle, with moderate depressions in the postero-lateral regions. Pubic process lyri-form, distal end with a V-shaped emargination producing a bifid tip, somewhat reflexed.

Species known only from Oklahoma.

PHYLLOPHAGA INFLEXA Barrett

Phyllophaga inflexa Barrett, 1935, Canad. Ent. 67: 49.

Oval, slightly oblong, moderately robust, rufocastaneous to brown, dull. Clypeus feebly emarginate, the margin narrowly reflexed . . . (male) Antennae of 10-segments, club subequal . . . Spurs of posterior tibiae slender, equal in length to first tarsal segment, upper slightly longer, both movable. Claws evenly curved, tooth right-angled and median. Length 14–18 mm. (Barrett, 1, p. 49.)

MALE. Genitalia (pl. 41, nos. 7 and 8). Apodeme about 3 mm. long,

the posterior portion slightly flattened. Phallus symmetrical; phallobase very broad, slightly depressed in the dorsal region. Parameres aborted, united on venter, long extended, terminating in a bifurcate apex; distal opening ovate.

FEMALE. One specimen seen, and this lacked the genitalia. Taken only in Arizona. Rare.

PHYLLOPHAGA FUCATA (Horn)

Lachnosterna fucata Horn, 1887, Amer. Ent. Soc. Trans. 14: 278.

Phyllophaga fucata, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Phyllophaga linsleyi Saylor, 1936, Jour. Ent. and Zool. 28 (1): 4.

Oblong, slightly ovate, reddish-brown or pale castaneous, surface very shining. Head not broad. Clypeus emarginate, slightly concave, the margin narrowly reflexed . . . Claws arcuate, the tooth moderate in size, slightly intramedian. Length 0.55–0.65 inch; 14–16.5 mm. (Horn, 27, p. 278.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI rounded; VII with a granulose flattened area on the posterior portion, producing an overhanging arcuate ledge. Sternum VIII very narrow, roughly granular, the posterior border unindented. Antennal club about one-third shorter than the stem. Spurs of hind tibia articulated, about of equal length, slender, hyaline tipped.

Genitalia (pl. 45, nos. 1–3). Apodeme about 1.5 mm. long, posterior portion broadly flattened and depressed, the border somewhat elevated and slightly emarginate on meson. Phallus symmetrical; phallobase broad. Parameres aborted, somewhat swollen in the middle of the dorso-lateral regions, depressed in the lower lateral areas, united on venter except for a short space at the tips; phallic structure rather short and squatty; and distal opening ovate.

FEMALE unknown.

Rare. Species known only from Arizona.

PHYLLOPHAGA PUSILLIDENS Fall

Phyllophaga pusillidens Fall, 1937, Canad. Ent. 69: 31.

Moderately elongate, rufocastaneous, highly polished, smooth puncturation, moderate. Antennae 10-segmented. Clypeus reflexed, the apex broadly but feebly emarginate. Claws arcuate, the tooth small and sub-basal. Length 20.2 mm.; width 8.2 mm.

MALE. Mesal region of sterna IV-VII impressed; more deeply on V and VI than on IV and VII. Sternum VIII slightly transversely depressed, the border slightly emarginate. Antennal club shorter than the stem. Lower spur of hind tibia about two-thirds as long as the upper spur. Both spurs articulated, slender and obtuse.

Genitalia (pl. 35, nos. 6-9). Apodeme 3 mm. long, rounded on dorsum, the posterior border wavy with a broad, slight emargination. Phallus symmetrical, tubular; phallobase narrow. Parameres aborted, narrow, moderately long extended, ending in a fused obtuse tip bent cephalad. Distal opening broadly oval.

FEMALE unknown.

Appears from May to August.

Taken only in southern Texas. Not common.

PHYLLOPHAGA IGNAVA (Horn)

Lachnosterna ignava Horn, 1887, Amer. Ent. Soc. Trans. 14: 280.

Phyllophaga ignava, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, cylindrical, chestnut-brown, shining. Head broad, eyes moderately prominent. Clypeus flat, feebly emarginate, the border very narrowly reflexed. . . . Claws feebly curved, a moderate tooth at middle. Length 0.60-0.65 inch; 15-16.5 mm. (Horn, 27, p. 280.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI rounded; VII unsculptured except a feeble transverse depression in the posterior portion. Sternum VIII very narrow, rugose, the posterior border regular. Antennal club about as long as stem. Lower spur of hind tibia articulated, about two-thirds as long as upper spur. Both spurs slender and acute.

Genitalia (pl. 51, nos. 8 and 9; pl. 56, nos. 10 and 11). Apodeme 2.5 mm. long, wider posteriorly than anteriorly, posterior region depressed, the border rather deeply and broadly incised. Phallus symmetrical; phallobase extremely broad, depressed on either side of meson. Parameres aborted, moderately long extended distad into small blunt recurvate tips, flattened, united and fused on venter except for a short distance at distal extremity; inner caudal border with a tooth on either side.

FEMALE. Genitalia (pl. 53, no. 12). Subgenital plates about 2 mm. wide, attingent on meson, widely diverging anteriorly, incised in the distal extremities producing small flaps which cover the more heavily chitinized borders above. Pubic process wanting.

Constant in all respects.

Adults active in July and August.

Taken in Arizona and southwestern Texas. Rare.

PHYLLOPHAGA RAVIDA GUATEMALICA Moser

Phyllophaga ravid guatemalica Moser, 1918, Stettin, Ent. Ztg. 79: 24.

Somewhat longer than *heterodoxa* but somewhat similar in color and polish. Clypeus markedly reflexed, slightly emarginate.

MALE. Mesal region of IV-VIII depressed and fluted; posterior border of VIII undulating. Antennal club somewhat shorter than the stem. Lower spur of hind tibia about two-thirds as long as the upper spur; both slender and acute.

Genitalia (pl. 40, nos. 10 and 11). Apodeme about 3 mm. long, the posterior border entire. Phallus symmetrical; phallobase very narrow. Parameres aborted, narrow, somewhat twisted distad, terminating in a fused thin triangular platelike tip. Aedeagus chitinized and somewhat exerted. Distal opening broadly oval.

FEMALE. Unknown.

Beetles appear in June.

Taken in Texas. Rare.

PHYLLOPHAGA RUBRICOSA Reinhard

Phyllophaga rubricosa Reinhard, 1939, Kans. Ent. Soc. Jour. 12: 47.

Form variable in the sexes, reddish brown, surface above alutaceous and feebly shining. Clypeus concave, vaguely emarginate, moderately reflexed. . . . Antennae with 10 segments. Legs shining, reddish brown; tooth of claw always well developed, acute, intramedian. Length 12-15 mm.; width 6-8 mm. (Reinhard, 48, p. 47.)

MALE. Mesal region of sterna V-VII flattened, slightly dished on V and VI. Sternum VIII rounded, the posterior border straight. Antennal club about one-half as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper. Both spurs acutish.

Genitalia (pl. 32, nos. 1-3). Apodeme about 3 mm. long, posterior portion rounded, the border slightly concave. Phallus symmetrical; phallobase narrow. Parameres narrow, moderately long extended distad, united on the venter and terminating in a monodentate recurved tip; distal opening circular.

FEMALE. Genitalia (pl. 32, no. 4). Subgenital plates about 2.5 mm. across, rounded, distal borders erose. Pubic process a broad plate, truncate and erose at distal extremity.

Adults appear from March to May.

Reported only from Texas. Not common.

PHYLLOPHAGA PLEROMA Reinhard

Phyllophaga pleroma Reinhard, 1940, Kans. Ent. Soc. Jour. 13: 5.

Phyllophaga plena Reinhard, 1939, Kans. Ent. Soc. Jour. 12: 49.

Form variable in the sexes, castaneous to piceous, glabrous above, subshining. Clypeus subconvex, broadly vaguely emarginate, moderately reflexed. . . . Antennae 10-segmented. Length 19-24 mm.; width 10-13 mm. (Reinhard, 49, p. 5.)

MALE. Mesal region of sterna IV-VI flattened, dished; VII flattened, papillose, plicate on sides. Sternum VIII longitudinally impressed on meson, the posterior border slightly convex and entire. Antennal club

about as long as the stem. Lower spur of hind tibia articulated, about two-thirds as long as the upper. Both spurs broad.

Genitalia (pl. 56, nos. 6-8). Apodeme about 5 mm. long, depressed on either side of meson, posterior border markedly concave. Phallus symmetrical; phallobase very narrow. Parameres moderately long extended, depressed on sides, terminating on ventro-meson in blunt attingent apices.

FEMALE. Genitalia (pl. 56, no. 9). Subgenital plates about 3 mm. across, unsculptured, distal ends somewhat truncate. Pubic process placoid, with a deep rounded emargination at distal end producing a bifurcate structure; apices obtusely rounded.

Adults appear in February and March.

Known only from Texas. Not common.

PHYLLOPHAGA LUCTUOSA (Horn)

Lachnosterna luctuosa Horn, 1887, Amer. Ent. Soc. Trans. 14: 254.

Phyllophaga luctuosa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Lachnosterna rugosoides Linell, 1896, U.S. Natl. Mus. Proc. 18: 728; Robinson, 1938, Amer. Ent. Soc. Trans. 64: 114.

Oblong-oval, broader behind, convex, the ♀ slightly ventricose, dark brown or piceous, moderately shining. Clypeus slightly emarginate, the border narrowly reflexed. . . . Claws curved, strongly and equally toothed at middle in both sexes. Length 0.79-0.87 inch; 20-22 mm. (Horn, 27, p. 254.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI flattened, slightly dished; VII with a transverse finely papillose, arcuate ridge and a depression behind. Sternum VIII markedly depressed, the depression scabrous (pl. 9, no. 1). Antennal club shorter than the stem. Lower spur of hind tibia unarticulated, and as long as the upper spur. Both spurs slender and acutish.

Genitalia (pl. 56, nos. 1-4). Apo-

deme about 5 mm. long with a deep transverse depression in the posterior region, the border markedly concave. Phallus asymmetrical, at right angles to apodeme; phallobase reduced to a collar prolonged into a short obtuse tip. Left paramere slightly conchate, with an invagination of the lower inner face producing a ledge extending caudo-ventrally and ending in a blunt tip, the tip accentuated by a retraction of the lower lateral border. Right paramere deeply invaginated on the lower inner face and much depressed above producing a concavity, the depression is obliterated caudo-ventrally and the paramere ends in a wide blunt, thin tip; as in right paramere, the tip is accentuated by a retraction of the lower lateral border.

FEMALE. Frequently larger than male, the abdomen large and swollen, sternum VIII with a triangle-shaped depression with the apex pointing cephalad; depressed area pitted and hairy.

Genitalia (pl. 56, no. 5). Subgenital plates about 2 mm. long, about as wide, edges somewhat raised along suture line and usually pale; distal region with an auriculate concavity on either side. Pubic process composed of two stout stems touching or almost so in the proximal region widely diverging distad, with their ends rounded.

Fairly constant in form and shape, but sometimes quite unequal in size in the same habitat.



FIGURE 55.—Distribution of *luctuosa* in the United States.

Adults appear from middle of March to middle of June.

Occurs in Atlantic and eastern Gulf States. It has also been taken in Iowa and Oklahoma (fig. 55). One of the commonest species in central South Carolina, apparently a sand hill species.

HOST FAMILIES. 2—Beech, birch, buckwheat, custard apple, ebony, elm, grass, honeysuckle, mulberry, pine, pulse, rose, rue, tupelo, vervain, vine, walnut, willow, witchhazel.

PHYLLOPHAGA VEHEMENS (Horn)

Lachnosterna vehemens Horn, 1887, Amer. Ent. Soc. Trans. 14: 244.

Phyllophaga vehemens, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, moderately robust, fuscous to piceous, shining. Clypeus slightly emarginate, somewhat concave, margin moderately reflexed. . . . Claws curved, the tooth median and strong, a little longer in the female. Length 0.84–0.86 inch; 21.5 mm. (Horn, 27, p. 244.)

Antennae 10-segmented.

MALE. (pl. 3, no. 3). Mesal region of sterna IV–VI markedly dished; VII with an arcuate ridge near the posterior border, ridge acutish on the sides and rounded on meson. Sternum VIII slightly depressed, the border slightly concave (pl. 10, no. 10). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, hooked at tip and not quite as long as the truncate upper spur (pl. 1, no. 2).

Genitalia (pl. 57, nos. 1–5). Apodeme about 5 mm. long, depressed along the ridged, slightly concave posterior border. Phallus asymmetrical; phallobase broad, parameres with caudal borders broad and flat, terminating in broad apices, each bearing a depressed emargination near the upper corner. Right paramere more deeply depressed on the lateral and ventral border than the left paramere, and when viewed from the right side simulates the sides of a bird's open bill; distal opening somewhat circular.

FEMALE. Genitalia (pl. 57, no. 6). Subgenital plates 3 mm. across, not quite as long as wide, with a narrow but deep transverse invagination in the posterior region; distal portions deeply concave. Pubic process V-shaped, composed of two slender diverging stems arising from between the distal parts of the plate; inserted portions of stems narrowly united. Sometimes distal portion of plate together with process bent dorsad almost at right angle with proximal portion of plate.

Constant in color, shape and size including genital characters; pubic process of female sometimes more in shape of letter Y than V.

Adults appear from middle of March to middle of June.

Taken mostly in Mississippi Valley States (fig. 56).

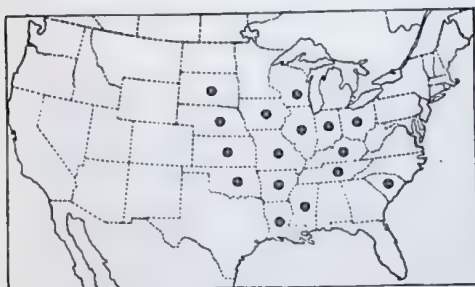


FIGURE 56.—Distribution of *vehemens* in the United States.

HOST FAMILIES. 2—Beech, maple, pulse, rose, walnut, willow. 3—Elm, rose.

PHYLLOPHAGA FUTILIS (LeConte)

Lachnosterna futilis LeConte, in Agassiz, 1850, Lake Superior, Its Physical Character, Vegetation, and Animals, p. 226.

Ancylonychia gibbosa Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 324.

Lachnosterna decidual LeConte, 1856, Acad. Nat. Sci. Phila. Jour 3 (ser. 2): 246.

Lachnosterna serricornis LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 247.

Phyllophaga futilis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, convex, slightly broader behind. Color variable from reddish brown to

rufotestaceous, moderately shining. Clypeus very feebly emarginate. Claws arcuate. A strong, acute median tooth in both sexes. Length 0.48–0.64 inch; 12–17 mm. (Horn, 27, p. 230.)

Antennae 10-segmented.

MALE. (pl. 5, no. 1). Mesal region of sterna IV–VI moderately dished; VII transversely ridged with a granulose depression behind and rugose at the sides in front. Sternum VIII hemispherically depressed, the border of the arch of the depression ridged (pl. 10, no. 3). Antennal club a little shorter than stem. Lower spur of hind tibia boot-shaped, unarticulated, and about as long as the upper spur (pl. 1, no. 8).

Genitalia (pl. 57, nos. 7–10). Apodeme about 4 mm. long, slightly transversely depressed in the posterior section, posterior border deeply angularly excised. Phallus symmetrical, deeply angularly excised in the cephalo-dorsal region producing a narrow phallobase. Membranous area diamond shaped. Parameres aborted, the caudo-lateral areas rounded forming a circular distal opening; cephalo-laterad rather long extended, terminating in rounded tips; lower lateral borders erose; inner faces of lobes on venter fluted.

FEMALE. Posterior border of sternum VIII slightly extended to the rear on the meson.

Genitalia (pl. 57, no. 11). Subgenital plates about 2 mm. across, attinent on meson, rounded, unsculptured, truncate at distal ends. Pubic process composed of a conchate plate deeply emarginate at apex and with a pronounced sharp ridge on the ventro-meson from base of emargination to base of process, depressed on either side of ridge; distal ends slightly recurvate.

Constant in all respects except some variation in size.

Beetles appear from middle of March to middle of July.

Taken in all parts of the eastern United States (fig. 57). Very com-

mon in various sections and appears every year in moderate numbers. In Canada it has been taken in large numbers at many points in the Province of Ontario. Also recorded from New Brunswick.

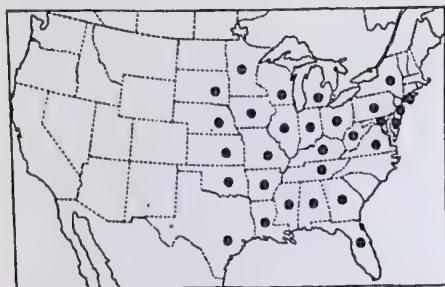


FIGURE 57.—Distribution of *futilis* in the United States.

HOST FAMILIES. 2—Beech, birch, elm, grass, honeysuckle, mallow, maple, mulberry, olive, pulse, rose, saxifrage, walnut, willow. 3—Basswood, beech, birch, buckeye, buttercup, composite, dogwood, ebony, elm, grass, honeysuckle, laurel, lily, logania, maple, nettle, oleaster, plane-tree, pulse, rose, St.-Johns-wort, saxifrage, walnut, willow, witchhazel. Canada—Basswood, beech, elm, honeysuckle, pulse, rose, walnut, witchhazel.

PHYLLOPHAGA UNIFORMIS (Blanchard)

Ancylonycha uniformis Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 133.

Lachnosterna carolina Fall, 1912, Canad. Ent. 44: 43.

Phyllophaga uniformis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Elongate, cylindrical, testaceous, head and thorax darker, usually rufotestaceous, moderately polished. Clypeus broadly but only feebly emarginate; the border moderately reflexed. Antennae 10-segmented. Claws broadly arcuate, the tooth short, median, stout, acute. Length 13.8 mm., width 6.8 mm.

MALE. (pl. 7, no. 1). Mesal region of sterna IV–VI slightly flattened; VII with a lunate granulose depression along posterior border. Sternum VIII much depressed and

somewhat emarginate on the meson of the caudal border, producing a bilobed tip. Antennal club somewhat shorter than stem. Lower spur of hind tibia aborted, unarticulated, upper spur long and slender (pl. 1, no. 1).

Genitalia (pl. 58, nos. 1–4). Apodeme about 2.5 mm. long, depressed in posterior region, the border deeply concave. Phallus symmetrical, anteriorly deeply concave on dorsum producing a narrow phallobase. Membranous area elliptical, large. Parameres aborted, broad and long, extending caudad and mesad almost touching in that region, incised in lower caudal region producing short clawlike tips; parameres also extend cephalad on venter ending in round blunt protuberances, somewhat boat-shaped, markedly depressed cephalad to the protuberances; distal opening oval.

FEMALE. Genitalia (pl. 58, no. 5). Subgenital plates rather small about 1.5 mm. wide, rounded, attingent in the anterior region, widely diverging posteriorly, when extended often widely separated by pubic process. Pubic process consists of a stout hornlike attenuate structure, terminating in a blunt apex sometimes slightly fluted on ventro-meson more conspicuously at base evanescent distad.

Constant in general and specific characters.

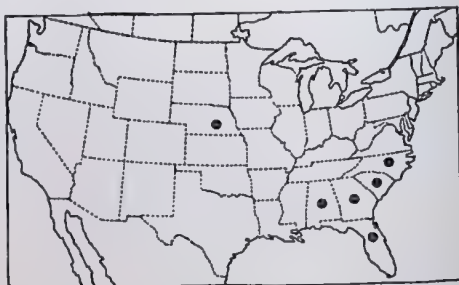


FIGURE 58.—Distribution of *uniformis* in the United States.

Adults appear from middle of May to latter part of June.

Occurs in Southeastern States; one specimen from Nebraska (fig. 58). A fairly common species.

HOST FAMILIES. 2—Beech, ebony, rose, sumac.

PHYLLOPHAGA CALCEATA (LeConte)

Lachnosterna calceata LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 250.

Phyllophaga calceata, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong oval, broader behind, subdepressed, castaneous, shining. Clypeus emarginate, more deeply in the female, margin rather widely reflexed. . . . Claws arcuate, the tooth median and strong, longer in the female. Length 0.75–0.80 inch; 19–20 mm. (Horn, 27, p. 236.)

Antennae 10-segmented.

MALE. (pl. 8, no. 4). Mesal region of sterna IV–VI flattened and dish-shaped; VII with a prominent broad ridge on either side, the ridges sloping and granulose in front, precipitous and somewhat undermined behind. Sternum VIII slightly depressed, the posterior border entire and feebly concave (pl. 10, no. 1). Antennal club about as long as the stem. Lower broad obtuse unarticulated spur about one-third as long as the narrow acute upper (pl. 1, no. 12).

Genitalia (pl. 58, nos. 6–9). Apodeme about 5 mm. long, the posterior portion depressed, the border straight, entire. Phallus asymmetrical, thick, fluted in the rear and flared; phallobase, very narrow. Left paramere: upper lateral region slightly emarginate; cephalo-lateral border depressed, the lower region excised and invaginated forming the broad truncate tip. Right paramere: upper lateral region slightly emarginate, ventral area broadly flattened and terminating into a truncate apex broader than that of left paramere; region immediately above inner or upper tip angle deeply incised. Phallic organ supported by a broad chitinous structure below.

FEMALE. Sternum VIII with a

narrow depressed area along the feebly concave end.

Genitalia (pl. 58, nos. 10 and 11). Subgenital plates about 2.5 mm. long, attingent and depressed in the middle, diverging posteriorly disclosing the pubic process above and terminating on the sides in rounded and somewhat depressed distal extremities. Pubic process somewhat biclavate, the larger ends proximad, connate, somewhat fused, smaller ends distad, bent ventrad, somewhat attenuate, ending in rounded apices.

Constant in color, size, and form, somewhat variable in pubic process of female genitalia, particularly in width of proximal portion and size of distal stems.

Beetles active from middle of March to middle of June.

Taken mostly in the southern half of the central area of the United States (fig. 59). Common in some localities.



FIGURE 59.—Distribution of *calceata* in the United States.

HOST FAMILIES. 2—Beech, elm, walnut, willow. 3—Elm.

PHYLLOPHAGA PRAETERMISSA (Horn)

Lachnosterna praetermissa Horn, 1887, Amer. Ent. Soc. Trans. 14: 223.

Lachnosterna definita Smith, 1889, U. S. Natl. Mus. Proc. 11: 501.

Phyllophaga praetermissa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly broader behind dark rufotestaceous to piceous brown, usually paler beneath, moderately shining. Clypeus feebly emarginate, the border narrowly reflexed. . . . Claws arcuate, a strong acute

tooth at middle. Length 0.58-0.64 inch; 15-16 mm. (Horn, 27, p. 223.)

Antennae 10-segmented.

MALE. (pl. 6, no. 2). Mesal region of sterna IV-VI flattened, narrowly dished; VII transversely crossed with a cucumiform ridge rounded in front, rather precipitous behind and depressed along posterior border. Sternum VIII rather broadly depressed, the posterior border slightly concave (pl. 9, no. 2). Antennal club about one-fourth larger than the stern. Lower spur unarticulated, usually less than one-half the length of the upper spur, sometimes much less.

Genitalia (pl. 59, nos. 1-4). Apodeme about 3 mm. long, posterior portion eroded, the border slightly concave and raised. Phallus asymmetrical; phallobase very narrow. Left paramere conchate, slightly excavated on dorsum, ridged laterally, the area caudad flattened cephalad, somewhat depressed and invaginated in the lower cephalo-lateral region forming the rather long acutish hamate tip. Right paramere narrower than left, somewhat conchate, invaginated in the lower cephalo-lateral region, and at the cephalic end of the inner face producing an obtuse tip and a fluted rear.

FEMALE. Posterior border of sternum VIII broadly concave.

Genitalia (pl. 59, no. 5). Subgenital plates about 1.5 mm. long, conchate, attingent in the middle, diverging anteriorly, depressed in the distal region and divergent, disclosing the pubic process, ending in blunt apices. Pubic process composed of two flat stems, connate and fused for two-thirds of the proximal length, diverging distad and ending in rounded or truncate apices.

Beetles appear from March to middle of July.

Taken mostly in the Mississippi Valley drainage area (fig. 60). Fairly common.



FIGURE 60.—Distribution of *praetermissa* in the United States.

HOST FAMILIES. 2—Beech, dogwood, ebony, elm, loosestrife, maple, olive, pulse, rose, tupelo, walnut, willow. 3—Elm.

PHYLLOPHAGA SCHAEFFERI Saylor

Phyllophaga schaefferi Saylor, 1937, Rev. de Ent. 7 (2-3): 320.

Lachnosterna georgiana Schaeffer, 1909, Brooklyn Inst. Arts and Sci., Mus. Sci. Bul. 1 (15): 382; Saylor, 1937, Rev. de Ent. 7 (2-3): 321.

Phyllophaga duvalis Robinson, 1938, Amer. Ent. Soc. Trans. 64: 110.

Form and color of *ephilida* Say, clypeus broadly emarginate; margin reflexed. Length 17 mm. (Schaeffer, 67, p. 382.)

Antennae 10-segmented.

MALE. Mesal region of sternum IV flattened; V-VI dished; VII with a papillose ridge along the posterior border, much wider on meson than on sides. Sternum VIII with a cup-like depression on meson, the posterior border of segment slightly concave, entire. Antennal club about as long as the stern. Lower spur of hind tibia unarticulated, broad, obtuse and somewhat less than one-half as long as the upper slender acute spur.

Genitalia (pl. 59, nos. 6-7). Apodeme about 3 mm. long, the posterior region transversely depressed; the border roundly excised. Phallus almost symmetrical; phallobase very narrow, collarlike. Parameres with upper lateral regions roundly and deeply excised, producing spine-like processes in the upper caudal regions, the process on the right paramere somewhat shorter; latero-ven-

tral areas of parameres invaginated producing blunt tips, the one on the right being more obtuse and somewhat shorter than the one on the left.

FEMALE. Genitalia (pl. 59, no. 8). Subgenital plates about 2 mm. across, widely diverging anteriorly, attinent in the middle, deeply depressed in the distal area to accommodate the pubic process. Pubic process platelike, resembling a tulip, with the broad end distad.

Beetles active in March, apparently an early flier.

Taken in several southeastern States (fig. 61). Uncommon.



FIGURE 61.—Distribution of *schaefferi* in the United States.

HOST FAMILIES. 2—Beech, rose, tupelo, witchhazel.

PHYLLOPHAGA FORBESI Glasgow

Phyllophaga forbesi Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 378.

Moderately elongate, subcylindrical, rufo-testaceous, moderately shining. Clypeus broadly emarginate, moderately reflexed. Claws strong, slightly intramedian in male, median in female. Length 14–17 mm. (Glasgow, 22, pp. 378–379.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI flattened, slightly dished; VII with a feeble arcuate ridge, the area enclosed, granulose. Sternum VIII slightly emarginate on meson of posterior border, depressed on meson, the depression extending to and including the area of emargination; border on either side of emargination somewhat advanced and rounded (pl. 10, no. 9). Antennal club not

quite as long as the stem. Spurs of hind tibia both slender, the lower unarticulated about one-half as long as the upper spur.

Genitalia (pl. 60, nos. 1–4). Apodeme about 3 mm. long, posterior portion transversely depressed, the border angularly excised. Phallus symmetrical; phallobase rather broad, deeply concave anteriorly. Membranous area diagonal. Parameres aborted, depressed laterally and ventrally, involute along caudo-dorsal borders, long extended anteriorly on venter, depressed along cephalo-lateral border ending in rounded reflexed extremities; cephalo-ventral borders terminating in short, blunt protuberances; caudo-ventral borders supplied with spinose protuberances, attinent at their apices; distal opening broadly oval; caudo-dorsal opening cordate.

FEMALE. The caudal border of sternum VIII somewhat retracted on the meson.

Genitalia (pl. 60, nos. 5 and 6). Subgenital plates about 2 mm. across, round on sides, attinent a little in front of the middle, divergent posteriorly disclosing the pubic process above, unsculptured. Pubic process spatelike, usually widest in the middle, attenuate from this point into an acute apex, the sides below middle, usually straight though sometimes slightly incurvate; slightly keeled on ventro-meson.

Variable in color, from light brown to dark reddish brown, and in size. Form fairly constant. Male genitalia constant but pubic process of female genitalia varies considerably in width and length.

Beetles appear from first of April to latter part of July.

Taken in the central portion of the United States (fig. 62). Common in some sections.

HOST FAMILIES. 2—Beech, ebony, elm, logania, planetree, pulse, rose, saxifrage, walnut, willow.

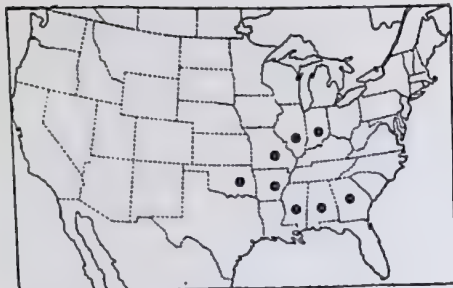


FIGURE 62.—Distribution of *forbesi* in the United States.

PHYLLOPHAGA FERVIDA (Fabricius)

Melolontha fervida Fabricius, 1781, Species Insectorum, Tomus I, p. 36.

Melolontha quercina Knoch, 1801, Neue Beytraege zur Insectenkunde, Teil I, p. 74.

Lachnosterna arcuata Smith, 1888, Insect Life 1: 183.

Phyllophaga fervida, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 370.

Oblong, testaceous to fusco-piceous, somewhat polished. Clypeus emarginate, the margin slightly reflexed. Antennae 10-segmented. Claws arcuate, with median rather stout tooth. Length 19.5 mm.; width 10.1 mm.

MALE. (pl. 3, no. 6). Mesal region of sterna IV–VI flattened, somewhat dished; VII crossed transversely by an arcuate ridge undermined behind; VIII moderately depressed, the posterior border broadly emarginate (pl. 9, no. 4). Antennal club about as long as the stem; lower spur of hind tibia unarticulated, about two-thirds as long as the upper spur.

Genitalia (pl. 60, nos. 7–11). Apodeme 5 mm. long, its posterior border and the meson of the caudal section ridged. Phallus nearly symmetrical; phallobase moderately broad. Parameres much flattened on the dorso-caudal borders, extending ventrad and terminating into notched apices; inner apices usually touching, lateral and ventral sides of parameres much depressed, the depression somewhat deeper on the right than on the left paramere; distal opening ovate.

FEMALE. Genitalia (pl. 60, no. 12). Subgenital plates 2.5 mm. across, cir-

cular, with a transverse depression near the middle, distal portions much depressed. Pubic process, composed of a short broad proximal stem and two short widely diverging distal stems, resembles a squatty Y.

Constant in color, size, form and phallic characters.

Beetles appear from the latter part of March to the first of July. Among the first species to appear in spring.

It has been taken in most of the States in the eastern half of the United States, and has also been taken in Idaho and California (fig. 63.). One specimen was taken in Canada. Common species in the Central States of the United States, the grubs doing great damage to cereal and forage crops.



FIGURE 63.—Distribution of *fervida* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, grass, honeysuckle, logania, maple, olive, pine, pulse, rose, tupelo, vine, walnut, willow, witchhazel. 3—Beech, dogwood, ebony, elm, grass, pulse, rose, walnut, witchhazel.

PHYLLOPHAGA FUSCA (Froelich)

Melolontha fusca Froelich, 1792, Der Naturforscher, Stück 26, p. 99.

Melolontha fervens Gyllenhal, 1817, Synonymia Insectorum (Schoenherr), t. I, pt. 3, Appendix, p. 74.

Phyllophaga fusca, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Form usually oblong, although somewhat variable, rufocastaneous, brown or piceous, shining. Clypeus slightly emarginate, the border moderately reflexed. . . . Claws curved, the tooth median (pl. 1, no. 14), always stronger in the female. Length

0.70–0.95 inch; 17.5–23.5 mm. (Horn, 27, p. 245.)

Antennae 10-segmented.

MALE. (pl. 3, no. 1). Mesal region of sterna IV–VI dished; VII with a transverse cucumiform scabrous ridge. Sternum VIII slightly depressed in caudal region, anterior border sometimes slightly ridged, posterior border straight (pl. 10, no. 7). Antennal club about as long as the stem. Lower spur of hind tibia about equal in width, unarticulated, and two-thirds as long as the upper spur.

Genitalia (pl. 61, nos. 1–5). Apodeme 5 mm. long with a shallow transverse depression in the posterior region, border slightly ridged, broadly and deeply concave. Membranous area on the dorsum lenticular in outline. Phallus symmetrical; phallobase narrow. Parameres with posterior borders rounded, the rounded portions widening and flattening caudo-ventrad into V-shaped apices. The rounded and flattened area of the right paramere is somewhat wider than that of the left and markedly depressed in front; distal opening almost circular.

FEMALE. Genitalia (pl. 61, no. 6). Subgenital plates 3 mm. wide converging caudad and with a transverse invagination in the posterior region. Pubic process, simple stem, usually about 1 mm. long, exserted for about one-half its length, apex rounded sometimes slightly emarginate.

Constant in size, color, form, and genital characters.

Beetles appear from latter part of March to July 1.

It has been taken in many of the States in the eastern half of the United States, and in Idaho (fig. 64); also in several of the Canadian provinces (fig. 65). Common in some sections of the United States and southwestern Ontario where the grub is destructive to field crops.

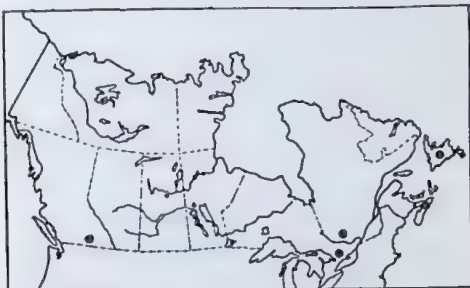


FIGURE 65.—Distribution of *fusca* in Canada.

HOST FAMILIES. 1—Olive, rose. 2—Basswood, beech, birch, calycanthus, dogwood, ebony, elm, heath, maple, olive, pulse, rose, tupelo, walnut, willow. 3—Basswood, beech, birch, buckeye, composite, dogwood, elm, honeysuckle, laurel, logania, maple, oleaster, olive, pulse, rose, walnut, willow, witchhazel.

PHYLLOPHAGA SPRETA (Horn)

Lachnosterna spreta Horn, 1887, Amer. Ent. Soc. Trans. 14: 250.

Phyllophaga spreta, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, elytra slightly wider at middle, castaneous or fuscous, shining. Clypeus feebly emarginate, margin very narrowly reflexed. . . . Claws curved, the tooth moderate in size and median ♂. Length 0.66–0.72 inch; 16.5–18 mm. (Horn, 27, p. 250.)

Antennae 10-segmented.

MALE. (pl. 7, no. 11). Mesal region of sterna IV flattened, V and VI dished, VII with a cucumiform, papillose elevation, depressed behind; sternum VIII depressed, the posterior margin broadly but not deeply



FIGURE 64. — Distribution of *fusca* in the United States.

emarginate. Antennal club about one-third longer than the stem. Lower spur of hind tibia unarticulated, stout, about two-thirds as long as the more slender upper spur.

Genitalia (pl. 62, nos. 1-5). Apodeme about 6 mm. long, the posterior portion slightly depressed with a slight elevation on either side of the meson along the posterior slightly concave border. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate in the upper caudo-lateral region depressed along the lower cephalo-lateral border invaginated below the depression, terminating in an obtuse tip. Right paramere not quite as large as left paramere, only slightly involute in the upper caudo-lateral area, depressed laterally particularly along the cephalo-lateral border, deeply and roundly invaginated in the latero-ventral region, forming an obtuse tip as in left paramere but broader with a larger and broader terminal area cephalad of the invagination than in other paramere. Phallus supplied from the inner base with a collar, extending caudad almost as far as the paramere but not as heavily chitinized and usually whitish in color.

FEMALE. Sternum VIII with a transverse depression.

Genitalia (pl. 62, nos. 6 and 7). Subgenital plates about 2 mm. long, attigent in the middle, widely diverging anteriorly, depressed on the sides of the distal end. Pubic process

a broad plate at right angles to genital plates, with sloping sides deeply emarginate at distal end forming a bifurcate extremity with twisted truncate apices; deeply depressed on ventro-meson.

Constant in all respects.

Adults appear in April and May.

Taken in one southern and three northern States (fig. 66). Very rare.

HOST FAMILY. 3—Walnut.

PHYLLOPHAGA CORROSA (LeConte)

Lachnosterna corrosa LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 249.

Lachnosterna affinis LeConte, 1856, Acad.

Nat. Sci. Phila. Jour. 3 (ser. 2): 252.

Phyllophaga corrosa, Glasgow, 1916, Ill.

Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong-oval, slightly broader behind, form rather robust, castaneous or brown, head usually darker, moderately shining. Clypeus rather broadly emarginate, the border narrowly reflexed. . . . Claws curved, with a strong median tooth rather longer in the female. Length 0.67-0.80 inch; 17-20 mm. (Horn, 27, p. 255.)

Antennae 10-segmented.

MALE. (pl. 7, no. 13). Mesal region of sterna IV-VI flattened, dished; VII transversely ridged, the ridge rounded and granulose in front, precipitous behind. Sternum VIII triangularly depressed, granulose, the posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper.

Genitalia (pl. 63, nos. 1-4). Apodeme about 4 mm. long, posterior portion transversely depressed, the border angularly concave. Phallus asymmetrical; phallobase narrow, subdorsal borders sloping, emphasizing the meso-dorsal area. Left paramere conchate, slightly excised along upper caudal border, slightly invaginated in the lower cephalo-lateral border, producing a short blunt tip. Right paramere fluted in the rear, producing two lobes, the inner usually the larger and sometimes slightly emarginate on the upper border; lower cephalo-lateral border in-



FIGURE 66.—Distribution of *spreta* in the United States.

vaginated producing a tip similar to that of left paramere but wider.

FEMALE. Sternum VIII with a triangular depression on meson and a broadly emarginate posterior border.

Genitalia (pl. 63, no. 5). Subgenital plates about 2.5 mm. wide, attingent on meson, lateral sides rounded and with somewhat auriculate depressions on the sides in the distal regions. Pubic process composed of two stems connate in the proximal region, widely diverging distad, ending in clavate apices; cephalad of base of stems of pubic process the border of plates is adorned with short rounded protuberances.

Species resembles *prunina* to a marked extent in genital characters, but is distinguished readily from that species in its absence of pruinosity. Constant in superficial characters. Variable in phallic structures of male, particularly in form of right paramere; outer lobule produced by channel sometimes much reduced or practically wanting.

Active from middle of March to early July.

Taken in several localities in central and southern United States (fig. 67). Not common.

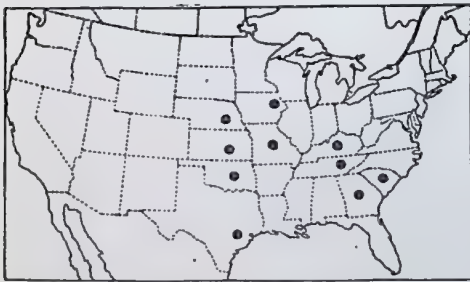


FIGURE 67.—Distribution of *corrosa* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, rose, walnut. 3—Beech, olive, pulse, rose.

PHYLLOPHAGA SYLVATICA
Sanderson

Phyllophaga sylvatica Sanderson, 1942, Kans. Ent. Soc. Jour. 15: 49.

This species is closely related to *corrosa* Leconte and *luctuosa* Horn and appears to occupy an intermediate position between the two. The body varies from reddish brown to nearly black and is shining and glabrous above except for some extremely minute hairs which arise from punctures on the disc of pronotum and elytra. Length 16–20 mm.; width 8.5–10.5 mm. (Sanderson, 56, p. 49.)

Antennae 10-segmented.

MALE. Sculpture and markings on sterna similar to *corrosa*...

Genitalia (pl. 61, nos. 7–10). Similar to *corrosa* except that the inner lobule produced by a channel is eroded in the upper area and the lower portion no farther advanced posteriorly than the outer lobule.

FEMALE. Genitalia (pl. 61, nos. 11 and 12). Similar to those of *corrosa* except the two stems of the pubic process are thicker and the rounded protuberances at the base of the stems are more developed in *sylvatica* than in *corrosa*.

Species has probably been confused with *corrosa*.

Adults appear from the latter part of March to the middle of June.

Taken in a number of localities in central and southern United States (fig. 68). Fairly common.



FIGURE 68.—Distribution of *sylvatica* in the United States.

HOST FAMILIES. 2—Beech, bladder-nut, ebony, elm, pulse, rose, sumac, walnut. 3—Beech.

PHYLLOPHAGA ULKEI (Smith)

Lachnosteria ulkei Smith, 1889, Ent. Amer. 5: 94.

Phyllophaga ulkei, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Form robust, ovate, rufocastaneous, shining. Clypeus slightly emarginate, the border moderately reflexed. . . . Claws curved, the tooth median, stronger in the female. Length 0.85 inch; 22-71 mm. (Smith, p. 94.)

Antennae 10-segmented.

MALE. (pl. 4, no. 7). Mesal region of sterna IV-VI flattened, somewhat dishd; VII transversely ridged along the caudal border, the ridge papillose. Sternum VIII slightly depressed, the border unindented. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, similar to upper spur but only about two-thirds as long.

Genitalia (pl. 64, nos. 1-5). Apodeme about 5 mm. long, the posterior portion transversely depressed, the border concave. Phallus somewhat asymmetrical; phallobase narrow. Membranous area lenticular in outline. Parameres with caudal borders rounded, flattened ventrally ending in notched somewhat twisted apices; lateral sides of the parameres somewhat cephalad of the rounded portions; distal opening ovate.

FEMALE. Genitalia (pl. 64, no. 6). Subgenital plates about 1.5 mm. wide, suture distinct. Pubic process composed of two stems about 1.5 mm. long, somewhat bat-shaped, inserted between the plates, inserted portions united, exerted slightly separated, diverging near the apices, which are rounded and knobular.

Phallic structure of male genitalia resembles somewhat that of *fusca*; however, the rounded portions of the caudal border are wider, the lateral depressions more shallow, and the phallobase much narrower in *ulkei* than in *fusca*.

Beetles active from latter part of March to middle of June.

Occurs mainly in the southeastern States (fig. 69). Fairly common in some sections.

HOST FAMILIES. 2—Beech, birch, dogwood, ebony, elm, figwort, grass, heath, honeysuckle, laurel, magnolia,

maple, olive, pine, pulse, rose, storax, sumac, tupelo, walnut, witchhazel.



FIGURE 69. — Distribution of *ulkei* in the United States.

PHYLLOPHAGA SODALIS Reinhard

Phyllophaga sodalis Reinhard, 1940, Kans. Ent. Soc. Jour. 13: 4.

Form oblong, slightly widened behind, dark castaneous to piceous, surface above glabrous, distinctly shining. Clypeus broadly emarginate, margin narrowly reflexed. . . . Antennae with 10 segments. Legs shining, reddish brown, tooth of claw strong, acute, median. Length 18-21 mm.; width 9-11 mm. (Reinhard, 49, p. 4.)

MALE. Mesal region of sterna IV-VI broadly depressed, VII conspicuously transversely ridged, the ridge papillose and precipitous behind. Sternum VIII with an ovate, deep impression, sharply ridged, in front on the sides, the posterior border entire but slightly concave. Antennal club about three-fourths as long as the stem. Lower spur of hind tibia spinose, unarticulated, about three-fourths as long as the upper acutish normal spur.

Genitalia (pl. 64, nos. 7-11). Apodeme about 5 mm. long, the posterior portion transversely depressed, the border rather deeply emarginate. Phallus asymmetrical; phallobase reduced to a collar, subdorsal borders sloping, emphasizing the meso-dorsal area. Left paramere, excised on the upper caudal border, invaginated in the lower cephalic region of the inner face, also slightly excised in the lower cephalic region of the outer face and ending in a broad emarginate tip. Right paramere slightly fluted

in the rear, slightly excised on the upper caudal border invaginated in the lower cephalic region of the inner face ending in a rather broad slightly emarginate apex.

FEMALE. Mesal region of sternum VIII markedly depressed in the posterior region, the border deeply excised and undulating.

Genitalia (pl. 64, no. 12). Subgenital plates about 3 mm. across, attingent on meson, the mesal borders projected distad into obtuse processes, above which the pubic process arises. Pubic process composed of two stems connate in the proximal region, diverging distad ending in rounded apices.

In ♀ genital characters quite similar to *corrosa* and *prunina*, male phallic structures differ.

Beetles appear in April.

Taken only in Texas. Not common.

PHYLLOPHAGA BIPARTITA (Horn)

Lachnosterna bipartita Horn, 1887, Amer. Ent. Soc. Trans. 14: 242.

Phyllophaga bipartita, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong, slightly oval, castaneous to piceous, moderately shining. Clypeus broadly, but feebly emarginate, margin moderately reflexed. . . . Claws arcuate, the tooth median and strong in both sexes. Length 0.60-0.75 inch; 15-19 mm. (Horn, 27, p. 242.)

Antennae 10-segmented.

MALE. (pl. 7, no. 5). Mesal region of sterna IV-VI markedly dished; VII with a ridge-like protuberance in the middle on either side, ridges undermined in the rear. Sternum VIII depressed, the posterior border straight, entire (pl. 10, no. 2), Antennal club as long as the stem. Lower spur of hind tibia unarticulated, about three-fourths the length of upper.

Genitalia (pl. 63, nos. 6-10). Apodeme about 4 mm. long, transversely depressed in the posterior region, the border straight, entire. Phallus asymmetrical; phallobase very narrow. Left paramere markedly excised in

the caudo-lateral area, producing a strong hamate process; invaginated in the lower cephalo-lateral region forming a short blunt tip. Right paramere depressed in upper lateral area, caudal border slightly emarginate; lower cephalo-lateral area invaginated, forming a short, blunt, somewhat broader tip than in left paramere.

FEMALE. Posterior border of sternum VIII undulating.

Genitalia (pl. 63, nos. 11 and 12). Subgenital plates about 2.5 mm. across, diverging anteriorly almost attingent in the middle and with auriculate depressions at the distal end. Pubic process arising from between the auriculate portions of the plates, lyrate in outline, composed of two stems, connate in the proximal region and widely diverging distad.

Constant in superficial characters and female genital characters, but variable in male phallic organ. Variation consists in the elimination of the hamate process in the upper caudo-lateral region of the left paramere, thus making this paramere approach the right paramere in likeness.

Active from first of March to latter part of August.

Taken mostly in central part of the United States (fig. 70). Quite common in some sections.



FIGURE 70.—Distribution of *bipartita* in the United States.

HOST FAMILIES. 2—Beech, ebony, elm, maple, pine, pulse, rose, walnut, willow. 3—Beech, pulse.

PHYLLOPHAGA INOPIA Sanderson

Phyllophaga inopia Sanderson, 1942, Kans. Ent. Soc. Jour. 15: 51, 52.

Superficially the species resembles *latidens* Schaeffer, in size, color, and general appearance. Its body is nearly parallel, light reddish yellow, and the pronotum is distinctly more red than the elytra. The dorsum, except the head, is glabrous and shining. Length 13-16 mm.; width 6-7.5 mm. (Sanderson, 56, pp. 51-52.)

Antennae 10-segmented.

MALE. (pl. 7, no. 2). Mesal region of IV-VI slightly flattened, VII slightly transversely depressed along the posterior border, the sides faintly rugose; VIII slightly depressed, conspicuously ridged on the sides of the cephalic border. Antennal club about two-thirds as long as the stem. Spurs of hind tibia slender, acutish, the lower about two-thirds as long as the upper spur.

Genitalia (pl. 65, nos. 8-11). Apodeme about 2 mm. long, the posterior portion markedly depressed, the border broadly and deeply convex. Phallus symmetrical, phallobase broad with a faint longitudinal median impression. Parameres narrow, long extended laterally, attenuate to obtuse apices; aedeagus chitinized and protruding conspicuously from the oval opening.

FEMALE. Genitalia (pl. 65, no. 12). Subgenital plates about 2 mm. across, rounded, attinent in the middle, broadly excised at the distal extremity, the excision truncate and supplies the opening for the pubic process. Pubic process placoid, the distal extremity erose, with two somewhat diverging, pale narrow bars across the process, one on either side and close to the meson.

Beetles appear in July.

Taken only in Chiricahua Mountains, Cochise Co., Ariz.

Rare.

PHYLLOPHAGA LATIDENS
(Schaeffer)

Lachnosterna latidens Schaeffer, 1906
Amer. Ent. Soc. Trans. 32: 258.

Phyllophaga latidens, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Oblong, broader behind, pale castaneous, shining. Clypeus short, transverse, margin moderately reflexed, apex emarginate. . . Length 15 mm. (Schaeffer, 66, p. 258.)

Antennae 10-segmented.

MALE. (pl. 7, no. 4). Mesal region of IV-VI broadly flattened and fluted; VII rounded, papillose. Sternum VIII broadly depressed, granulose and slightly fluted on meson, the posterior border slightly emarginate. Antennal club much shorter than the stem. Lower spur of hind tibia articulated and about as long as the slender, acute upper spur.

Genitalia (pl. 66, nos. 1-3). Apodeme about 3 mm. long, posterior portion slightly depressed on dorsum, more so on the sides along the rounded concave border. Phallus symmetrical; phallobase broad, concave in anterior region. Parameres aborted, much depressed in the lower cephalo-lateral regions, forming acute slightly overlapping recurvate tips; distal opening ovate.

FEMALE. Genitalia (pl. 66, no. 4). Subgenital plates about 2 mm. across, attinent and slightly depressed on meson, unsculptured, distal ends truncate. Pubic process a flat semicircular plate about as wide as the subgenital plates, with a longitudinal ridge on ventro-meson.

Adults appear in July.

Only two specimens seen, these taken in Santa Rita Mountains of Arizona. Scarce.

PHYLLOPHAGA GLABERRIMA
(Blanchard)

Ancylonycha glaberrima Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 136.

Phyllophaga glaberrima, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Lachnosterna parva Linell, 1896, U. S. Natl. Mus. Proc. 18: 726. (Separate 1096.)

Phyllophaga pagilis Saylor, 1937, Rev. de Ent. 7 (2-3): 321.

Oblong, cylindrical, rufotestaceous, shining. Head usually a little darker. Clypeus moderately deeply but broadly emarginate, margins moderately reflexed . . . Claws moderately curved, the tooth intramedian in the male, longer and median in the female. Length 0.50–0.60 inch; 13–15 mm. (Horn, 27, p. 224.)

Antennae 10-segmented.

MALE. (pl. 7, no. 7). Mesal region of sterna IV–VI narrowly dishd; VII with a granulose area on the meson abutted with a diagonal ridge on either side. Sternum VIII markedly concave, with a short rugose longitudinal ridge on either side of meson within concavity. Antennal club about as long as the stem. Lower spur, wanting or reduced to a small dentate unarticulated process. Upper spur rather long and slender (pl. 1, no. 9).

Genitalia (pl. 66, nos. 5–8). Apodeme about 3 mm. long, with a shallow depression immediately in front of the raised broadly concave posterior border. Phallus symmetrical, anterior border deeply excised producing a narrow phallobase. Membranous area circular in outline. Parameres aborted with caudal margins somewhat recurvate; rounded laterally, markedly depressed in the lower lateral regions, bent ventrad, producing sharp pointed tips at the caudal extremities and anteriorly round processes, close together one on each side of meson; distal opening ovoid.

FEMALE. Genitalia (pl. 66, no. 9). Subgenital plates about 3 mm. across, about as long as broad, unsculptured, attingent in the middle, diverging anteriorly and posteriorly. Pubic process oval plate, exerted for about one-half its length, distal end deeply emarginate producing a somewhat rounded tip on each side of emargination, emarginal area depressed, the depression extending anteriorly producing a fluted ventro-meson.

Adults appear from latter part of May to middle of July.

Apparently indigenous to Atlantic

coast and Gulf region (fig. 71). An uncommon species.

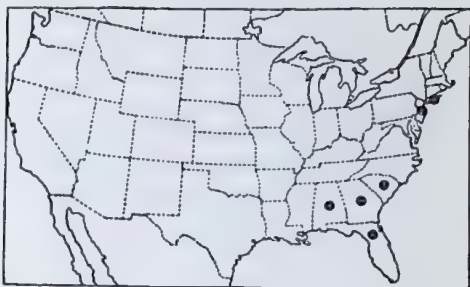


FIGURE 71.—Distribution of *glaberrima* in the United States.

HOST FAMILIES. 2—Beech, rose, walnut, witchhazel.

PHYLLOPHAGA INCURIA Sanderson

Phyllophaga incuria Sanderson, 1942, Kans. Ent. Soc. Jour. 15: 53.

Listrochelus texanus LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 263.

Phyllophaga texana, Sanderson, 1937, Kans. Ent. Soc. Jour. 10: 16, 17.

Form elongate-oval, subdepressed, slightly wider behind. Uniformly dark brown as in *rugosa* (Melsh.) with which this species is associated. Surface shining. Antennae 10-segmented. Clypeus rather deeply emarginate with margin moderately reflexed . . . Tooth of claw strong and median. Length 19 mm.; width 9.5 mm. (Sanderson, 54, pp. 16, 17.)

MALE. Mesal region IV to VI moderately depressed; VII rather deeply depressed along posterior border, plicate in front on the sides and papillose in between. Sternum VIII with a deep impression on meson, the border unindented. Antennal club much shorter than the stem. Lower spur squatty, unarticulated, obtuse, less than one-half as long as the upper acute spur.

Genitalia (pl. 67, nos. 1–4). Apodeme about 5 mm. long, markedly transversely depressed in the posterior region, the border slightly concave. Phallus asymmetrical; phallobase very narrow, collarlike. Left paramere, roundly excised in the upper lateral region producing an obtuse protuberance pointing mesad; flattened on the side and invaginated

in the lower cephalo-lateral region producing a blunt tip. Right paramere smaller than left paramere, with a more shallow excision in the upper lateral region and producing a smaller but acute protuberance; flattened in the lateral region, invaginated in the lower cephalo-lateral region producing a much broader tip than in the left paramere.

FEMALE. Sternum VIII somewhat depressed along the undulating border.

Genitalia (pl. 67, nos. 5 and 6). Subgenital plates about 2 mm. across, diverging anteriorly, attinent posteriorly and supplied with squatty obtuse processes and auriculate depressions above. Pubic process ladle-shaped, consisting of a broad proximal portion with thick ends, somewhat flattened borders and a narrow constricted fluted distal portion slightly emarginate at apex.

Genitalia of female resemble somewhat those of *fraterna*.

Adults appear in June and July.

Occurs in Oklahoma and Texas. Not common.

PHYLLOPHAGA INFIDELIS (Horn)

Lachnosterna infidelis Horn, 1887, Amer. Ent. Soc. Trans. 14: 253.

Phyllophaga infidelis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, broader behind, convex, chestnut-brown, head and thorax darker, shining. Clypeus moderately deeply emarginate, rather more acutely in the female, margin narrowly reflexed. . . . Claws arcuate, strongly equally toothed at middle in both sexes. Length 0.75-0.82 inch; 19-21 mm. (Horn, 27, p. 253.)

Antennae 10-segmented.

MALE. (pl. 7, no. 8). Mesal region of sterna IV-VI slightly flattened; VII crossed transversely with an arcuate granulate ridge behind which is a moderate depression. Sternum VIII moderately depressed on meson, the posterior border slightly concave. Antennal club not quite as long as the stem. Lower spur of hind tibia unarticulated, stubby, broad, less than

one-half as long as the upper spur (pl. 1, no. 6).

Genitalia (pl. 67, nos. 7 to 10). Apodeme about 4 mm. long, markedly transversely depressed in the posterior region, the border elevated and the end straight. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate, depressed, and excised in the upper lateral area producing a recurved spinous hook; invaginated in the lower lateral area forming another somewhat longer and stouter hook. Right paramere the smaller of the two, platelike without any distinctive ornamentation, slightly depressed along the upper anterior border, erose on the upper lateral edge; the upper caudal border sometimes advanced with a blunt tip; lower caudal border retracted and truncate.

FEMALE. Genitalia (pl. 67, nos. 11 and 12). Subgenital plates about 2.5 mm. across, diverging anteriorly, attinent posteriorly terminating distad on the dorsum into pointed apices; caudal areas on the sides markedly depressed. Pubic process squarish, thick, sides incurvate on ventral meson, markedly depressed, distal end narrowly but rather deeply emarginate producing a bilobed apex.

Constant in all respects.

Adults active from mid-March to early July.

Taken in two southeastern States. Rare.

HOST FAMILIES. 2—Beech, chicory, ebony, laurel, mulberry, pulse, rose, tupelo, walnut, willow, witchhazel.

PHYLLOPHAGA FOXII Davis

Phyllophaga foxii Davis, 1920, Ill. Nat. Hist. Survey Bul. 13 (art. 12): 334.

Body rufocastaneous to piceous, in the lighter specimens the head darker, sometimes both head and thorax darker. Clypeus moderately deeply emarginate, margin moderately reflexed. . . . Claws arcuate, with strong median tooth in both sexes. Length 16.5 to 18 mm. (Davis, 12, p. 334.)

Antennae 10-segmented.

MALE. (pl. 7, no. 9). Mesal re-

gion of sterna IV-VI flattened, slightly dished; VII depressed with an oblique ridge on either side, depression papillose; VIII markedly depressed on meson. Antennal club not quite as long as the stem. Lower spur of hind tibia obtuse, unarticulated and less than one-half as long as the acute upper spur.

Genitalia (pl. 68, nos. 1-5). Apodeme about 4 mm. long, transversely deeply depressed in the posterior region, the border straight. Phallus asymmetrical, the parameres distinctly separated, somewhat spreading. Phallobase narrow, collarlike. Left paramere conchate, somewhat rounded on the upper caudal margin, sometimes slightly incised on cephalo-dorsal margin, the lower border slightly invaginated producing a sharp pointed tip and a small hump immediately above. Right paramere scoop-shaped from the rear, with the involute area somewhat depressed in its inner face and extending farther distad than its base, the upper corner prolonged into a sharp spinelike process; caudo-ventrally the paramere flattens out broadly.

FEMALE. Genitalia (pl. 68, nos. 6 and 7). Subgenital plates as broad as long, depressed on suture line; distal ends on meson terminate into blunt protuberances; the sides extend laterad and distad, the outer distal portions bearing cup-shaped depressions. Pubic process short, thick, with a broad proximal portion and a constricted distal portion which is flattened at the slightly emarginate tip; sides at point of attachment rounded, the venter of process on basal portion deeply depressed.

Constant in form, shape, size, color, sculpture, and genital characters.

Beetles appear from middle of April to first of June.

Occurs in South Atlantic and Gulf States (fig. 72). Apparently a lowland species, fairly common in the plains area.



FIGURE 72.—Distribution of *foxii* in the United States.

HOST FAMILIES. 2—Beech, birch, ebony, elm, honeysuckle, pulse, rose, sweet gale, tupelo, willow, witchhazel.

PHYLLOPHAGA ANXIA (LeConte)

Lachnosterna anxia LeConte, in Agassiz, 1850, Lake Superior, Its Physical Character, Vegetation, and Animals, p. 226.
Ancylonycha brevicollis Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 132.

Ancylonycha puncticollis Blanchard 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 133.

Lachnosterna cephalica LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 245.

Ancylonycha uninotata Walker, in Lord, 1866, Naturalist in Vancouver Island and British Columbia, v. 2, p. 323.

Lachnosterna dubia Smith, 1888, Insect Life 1: 183.

Lachnosterna insperata Smith, 1889, Ent. Amer. 5: 93.

Lachnosterna alpina Linell, 1896, U. S. Natl. Mus. Proc. 18: 726.

Phyllophaga anxia, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong ovate, subdepressed, niger-castaneous, moderately polished. Clypeus emarginate, the border moderately reflexed. Antennae 10-segmented. Claws with a strong median tooth. Length 20.1 mm.

MALE. (pl. 3, no. 5). Mesal region of sterna IV-VI flattened, slightly dished; VII with a transverse scabrous cucumiform ridge and depression behind on either side. Sternum VIII slightly depressed, the posterior border broadly concave (pl. 9, no. 10). Antennal club about as long as the stem. Lower spur of hind tibia about one-half as long as the upper, unarticulated.

Genitalia (northern form: pl. 69, nos. 1-5; southern form: pl. 69, nos. 7-11). Apodeme about 5 mm. long, the posterior portion ridged on meson and along the slightly concave border. Phallus almost symmetrical at right angles to apodeme; phallobase very narrow. Parameres: upper borders much flattened with depressions in the middle, lower lateral and latero-ventral faces much depressed, caudal portions overhanging producing ledges; tips pointing cephalad; distal opening represents an inverted U with legs slightly divergent.

FEMALE. Genitalia (northern form: pl. 69, no. 6; southern form: pl. 69, no. 12). Subgenital plates about 3 mm. across, rounded on sides, posterior portion with a deep transverse depression, suture on ventro-meson distinct to depressed area; distal portion together with process sometimes bent dorsad. Pubic process composed of two flat stems inserted for about one-half their length; inserted portions united, exserted portions diverging, apices truncate. Space between exserted portions V-shaped.

A variable species resulting in the erection of several species by various authors; variations exist in size of adults and genital characters. Specimens from Utah only about half as large as those from other parts of country. A southern and northern form can be distinguished by a difference in the male phallic structures. In the southern form the inner faces on the upper borders of parameres are extended outward alarlike, while in northern forms this extension is usually absent. Some intermediate forms where this extension is small, encountered. In females variations occur mainly in the sculpture of genital plates, the transverse grooves varying in degree of emphasis, the distal portions either brief or prominent with auriculate pockets on the side and almost ex-

tending to the distal points of the process.

Beetles appear from the latter part of March to mid-August.

Widely distributed in the United States and Canada; taken in practically every State of the Union (fig. 73), and nine continental provinces and two insular provinces of Canada (fig. 74). Grubs are abundant in some sections in the United States and Canada and cause considerable damage to truck and field crops. According to Hammond it is the most common and injurious species inhabiting Canada.



FIGURE 73. — Distribution of *anxia* in the United States.

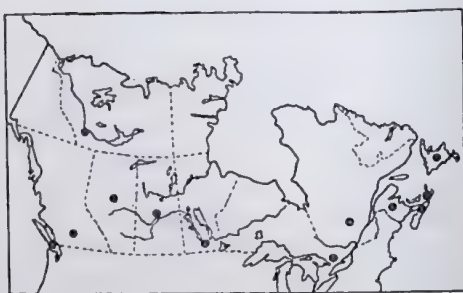


FIGURE 74.—Distribution of *anxia* in Canada.

HOST FAMILIES. 1 — Basswood, birch, maple, olive. 2—Beech, big-nonia, birch, buckeye, dogwood, ebony, elm, heath, honeysuckle, magnolia, mallow, olive, pulse, rose, sumac, sweet gale, tupelo, vine, walnut, willow, witchhazel. 3 — Basswood, beech, birch, dogwood, elm, laurel, maple, oleaster, olive, polemonium,

rose, tupelo, walnut, willow, witch-hazel. 4—Goosefoot. Canada—Rose, willow.

PHYLLOPHAGA HORNII (Smith)

Lachnosterna hornii Smith, 1889, Ent. Amer. 5:95-97.

Phyllophaga hornii, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong oval, not broader behind, convex, very deep-brown or piceous, shining. Clypeus moderately deeply emarginate, rather more acutely in the female, margin narrowly reflexed. . . . Length 0.75-0.85 inch; 19-21 mm. (Smith, 71, pp. 95-97.)

Antennae 10-segmented.

MALE. (pl. 3, no. 4). Mesal region of sterna IV-VI flattened; VII with a pronounced transverse arcuate ridge extending well up the sides and a very deep depression behind, somewhat undermining the ridge on either side. Sternum VIII broadly and rather deeply depressed on meson with a broad, angular excision on the posterior border. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about one-half as long as the upper spur. Both usually acute.

Genitalia (pl. 70, nos. 1-5). Apodeme about 5 mm. long, transversely depressed on the posterior portion, the border somewhat raised and undulating. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate, somewhat involute in the upper caudal border, slightly invaginated in the lower caudo-lateral border producing a blunt tip. Right paramere with a primary outer and a secondary inner lobe which are joined in the caudo-lateral region to form a very broad, rounded, distal extremity; inner face of secondary lobe deeply excavated and the upper caudal border projected into a hamate process.

FEMALE. Sternum VIII with an unevenly depressed area on the posterior portion of the segment, the border somewhat undulating, slightly farther advanced on the sides than on the meson.

Genitalia (pl. 70, nos. 6 and 7). Subgenital plates about 3 mm. across, attinent and the borders markedly depressed on the meson, terminating in rather sharp pointed apices; auriculate depressions at the sides of the distal extremities. Process composed of a broad somewhat circular proximal portion with a deep depression on the ventro-meson, and two short diverging stems with flat, round apices; process almost at right angles to plates.

Constant in all respects.

Beetles appear from middle of March to latter part of June.

Taken mainly in the eastern half of the United States except the New England States (fig. 75). Not abundant.



FIGURE 75.—Distribution of *hornii* in the United States.

HOST FAMILIES. 2—Birch, beech, ebony, elm, olive, planetree, pulse, rose, walnut, willow. 3—Birch, beech, planetree, pulse, rose, walnut.

PHYLLOPHAGA RUGOSA (Melsheimer)

Ancylonycha rugosa Melsheimer, 1846, Acad. Nat. Sci. Phila. Proc. 2 (1844-45): 140.

Phyllophaga rugosa, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, broader behind, moderately robust, rufocastaneous to piceous, shining. Clypeus acutely moderately deeply emarginate, border narrowly reflexed. . . . Claws curved, the tooth strong and median. Length 0.70-0.90 inch; 18-23 mm. (Horn, 27, p. 258.)

Antennae 10-segmented.

MALE. (pl. 8, no. 3). Mesal region of sterna IV-VI broadly flattened;

VII with a broad transarcuate, granulose ridge, the crest rounded on meson and rather sharp on sides; segment depressed behind ridge. Sternum VIII broadly rather deeply depressed, the posterior border emarginate. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about one-half as long as the upper spur.

Genitalia (pl. 71, nos. 6-10). Apodeme about .5 mm. long, posterior region transversely depressed, the border slightly raised and unindented. Phallus asymmetrical; phallobase reduced to a collar. Left paramere somewhat concave, upper lateral border slightly excised, upper inner face depressed forming a ledge, lower cephalic region invaginated forming a median angled tip. Right paramere, the smaller of the two, somewhat excised on the upper lateral border, markedly involute in lower lateral area forming a secondary inner lobe, with a broadly rounded tip, inner face of secondary lobe impressed.

FEMALE. Sternum VIII feebly concave on posterior border and sometimes moderately depressed on dorsum.

Genitalia (pl. 71, nos. 11 and 12). Subgenital plates about 2.5 mm. long, attaining in the middle, distal end prolonged on ventro-meson with short pointed processes, rounded on sides and with auriculate depressions. Pubic process composed of a concave proximal portion with rounded sides and a short distal portion fluted on ventro-meson, terminating in a spreading emarginate apex.

Generally constant in form, some variation in size and in color from light to dark reddish brown. Some variation in male phallic structure, the ledge on inner face of left paramere sometimes much reduced, particularly true of western forms; outer or primary lobe of such forms also reduced. In female, variation

occurs in form of pubic process; sometimes this is squatty, the sides of the proximal portion being rather sharply angular.

Adults active from April through July.

Taken mostly in the northern part of the eastern half of the United States (fig. 76), and in several of the Canadian provinces (fig. 77). Common in some sections of the United States and in southwestern Ontario, Canada, the grubs causing serious damage to crops.



FIGURE 76.—Distribution of *rugosa* in the United States.



FIGURE 77.—Distribution of *rugosa* in Canada.

HOST FAMILIES. 2—Beech, birch, dogwood, ebony, elm, mallow, plane-tree, pulse, rose, saxifrage, walnut, willow. 3—Barberry, basswood, beech, birch, buckeye, composite, dogwood, ebony, elm, grass, logania, maple, olive, pulse, rose, saxifrage, walnut, willow, witchhazel. Canada—Beech, maple, willow, witchhazel.

PHYLLOPHAGA LODINGI Sanderson

Phyllophaga lodingi Sanderson, 1939, Kans. Ent. Soc. Jour. 12: 4.

Form oblong, distinctly wider behind. Color from light brown to deep black. Dorsal surface shining, glabrous. Clypeus rather deeply emarginate with margin very slightly reflexed. . . . Tooth of claw strong and median. Antennae 10-segmented. Length 18.5-23 mm.; width 9.5-11.5 mm. (Sanderson, 55, p. 4.)

MALE. Mesal region of sterna IV-VI flattened; VII granulose, with a tuberculate process on either side and depressed along the posterior border. Sternum VIII broadly flattened, the posterior border slightly emarginate. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about half as long as the upper spur. Both spurs broad and acutish.

Genitalia (pl. 62, nos. 8-12). Apodeme about 4 mm. long, the posterior region deeply transversely depressed, the border convex. Phallus asymmetrical; phallobase narrow, collar-like. Left paramere somewhat conchate, deeply and roundly excised in the upper caudo-lateral region producing a spinose process in the upper caudal border; depressed in the lower lateral region and invaginated in the postero-ventral region producing a broad recurvate tip. Right paramere, smaller than the left, scoop-shaped from the rear produced by a secondary or inner lobe, invaginated in the postero-ventral region and ending in a very broadly rounded recurvate tip.

FEMALE. Genitalia (pl. 62, nos. 13 and 14). Subgenital plates about 3 mm. across, somewhat diverging anteriorly, attinent posteriorly, with an auriculate depression on each side of the distal extremity. Pubic process almost at right angles to plates, somewhat flask-shaped, with a broad proximal and a short distal portion slightly emarginate at apex; venter of proximal portion deeply excavated.

The male phallic structure resembles somewhat that of *foxii*, and the female genitalia belong to the *ilicis-knochii* group.

Beetles active in June.

Only three specimens seen. These taken in Madison County, Alabama.

PHYLLOPHAGA PEARLIAE Davis

Phyllophaga pearliae Davis, 1920, Ill. Nat. Hist. Survey Bul. 13 (art. 12): 332.

The specimens before me are moderately shining, quite variable in color, ranging from reddish brown to almost piceous, the lighter colored specimens with the head and thorax darker. Clypeus narrowly reflexed, moderately deeply and obtusely emarginate. . . . Claws arcuate, strongly and equally toothed at middle in both sexes. Length 18-20 mm. (Davis, 12, p. 332.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI flattened, slightly dished; VII rather deeply and widely depressed, the depression granulose and rugose on the sides. Sternum VIII broadly depressed, the posterior border slightly emarginate. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about one-half as long as the upper spur.

Genitalia (pl. 72, nos. 8-12). Apodeme about 6 mm. long, the posterior portion deeply transversely depressed, the broad border slightly elevated and regular. Phallus asymmetrical; phallobase, narrow, collar-like. Left paramere conchate, slightly depressed in cephalo-dorsal region, invaginated in the ventral region forming a short obtuse tip; slightly ridged on the inner face above the tip. Right paramere bilobed, the outer narrow, the inner deeply depressed on its inner face, bluntly hamate in its upper outer angle; invaginated on venter and terminating in a blunt tip.

FEMALE. Genitalia (pl. 31, nos. 10 and 11). Subgenital plates about 2.5 mm. across, attinent in middle, diverging anteriorly, blunt tipped posteriorly, on sides of distal portion deeply auriculate. Pubic process at right angles to plates lageniform with a rather long and half as broad proximal portion, somewhat constricted in the middle and a short stemlike distal portion slightly emar-

ginate at apex; ventro-meson of process fluted, the base of proximal portion rather deeply excavated.

Adults appear from May to July.

Taken at points mostly in the central United States (fig. 78). Rare. Only a few specimens seen.

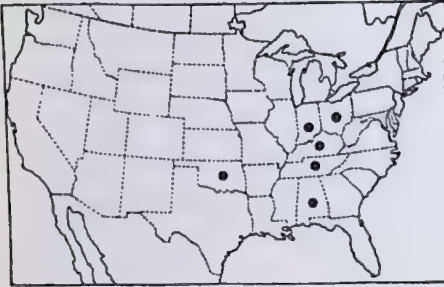


FIGURE 78.—Distribution of *pearliae* in the United States.

HOST FAMILIES. 2—Elm, planetree, pulse, walnut, willow. 3—Elm, pulse, walnut.

PHYLLOPHAGA FRATERNA Harris

Phyllophaga fraterna Harris, 1842, Insects Injurious to Vegetation, p. 29.

Lachnosterna fraterna, LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 249.

Ancylonycha cognata Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 323.

Phyllophaga fraterna, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, scarcely broader behind, rufo-testaceous, fuscous or piceous, shining. Clypeus moderately emarginate, the border narrowly reflexed. . . . Claws curved, the tooth strong and median. Length 0.59–0.70 inch; 15–18 mm. (Horn, 27, p. 251.)

Antennae 10-segmented.

MALE. (pl. 5, no. 6). Mesal region of sterna IV–VI flattened; VII arcuately, transversely ridged, the ridge granulose, sometimes broken on meson, depressed along posterior border. Sternum VIII broadly rather deeply depressed, the posterior border usually unindented, sometimes with a slight emargination on meson (pl. 10, no. 6). Antennal club not quite as long as the stem. Lower spur of hind tibia obtuse, unarticulated, and about one-half as long as the acute and more slender upper spur.

Genitalia (pl. 73, nos. 1–5). Apodeme about 4 mm. long, the posterior portion deeply transversely depressed, sometimes fluted on meson caudad of depressed area, posterior border unindented. Phallus asymmetrical; phallobase narrow, collar-like. Left paramere the larger of the two, conchate, depressed along caudolateral border and invaginated in the lower cephalic region, producing a rather long angular tip bent cephalad. Right paramere depressed laterally involute in the lower cephalic region producing an inner secondary lobe as large as the primary and a broad flattened obtuse tip; paramere appears fluted from the rear.

FEMALE. Genitalia (pl. 73, no. 6). Subgenital plates about 2 mm. across, attinent in the middle, distal ends on meson rather sharply pointed, on the sides rounded and with auriculate depressions. Pubic process composed of a broad rounded proximal portion, cupuliformly depressed on ventro-meson and narrow mesad curved distal portion, emarginate at apex; process resembles a ladle.

Fairly constant superficially though some variation in color from light to dark reddish brown. Slight variation in pubic process of female genitalia particularly in degree of roundness of the sides of the proximal portion and in degree of emargination of apex. The parameres of the phallus in two specimens taken at different points in Ohio; long extended, producing an abnormality in the species.

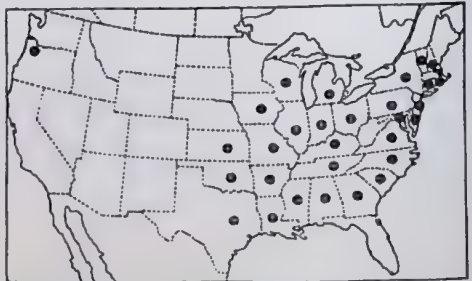


FIGURE 79.—Distribution of *fraterna* in the United States.

Adults appear from latter part of March to latter part of July.

Taken in the greater part of eastern United States and in Oregon (fig. 79). Common in some localities. It is also recorded as having been taken in the Province of Ontario, Canada.

HOST FAMILIES. 2—Beech, birch, ebony, elm, heath, logania, mallow, olive, planetree, pulse, rose, tupelo, walnut, willow. 3—Beech, ebony, elm, grass, honeysuckle, maple, pine, rose, walnut, willow, witchhazel.

Phyllophaga fraterna var. *mississippiensis* Davis (12, p. 330) (pl. 31, nos. 8 and 9; pl. 70, nos. 8–12).

Differs from *fraterna* mostly in size. Some variation in male phallic structure; involution area on upper caudal border of left paramere less broad (pl. 70, no. 8), and the invaginated area on right paramere (pl. 70, no. 9) less deep than in *fraterna*. Pubic process of female genitalia (pl. 31, no. 9; pl. 70, no. 12) similar to that of *fraterna* but larger.

Taken in Mississippi and Louisiana.

HOST FAMILIES. 2—Beech, dogwood, ebony, elm, lily, olive, planetree, pulse, rose, walnut, willow.

PHYLLOPHAGA KENTUCKIANA

Ritcher

Phyllophaga kentuckiana Ritcher, 1937, Ent. News 48: 285.

General form oblong, slightly dilated posteriorly. Medium to dark brown in color with slightly darker head and pronotum. Surface moderately shining. Clypeus rather deeply emarginate; margin reflexed . . . Tooth of claw median; long, nearly right angled in both sexes. Length 16–20 mm. (Ritcher, 51, pp. 285–287.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI flattened; VII with a low ridge on either side of meson, the ridge and intervening space granulose. Sternum VIII with a granulose depression and a slight emargination on the posterior border. Antennal

club not quite as long as the stem. Lower obtuse spur of hind tibia unarticulated, about half as long as the upper acutish spur.

Genitalia (pl. 73, nos. 7–11). Apodeme about 5 mm. long, posterior portion deeply transversely depressed, the highly polished border undented. Phallus asymmetrical, spreading; phallobase narrow, collar-like. Left paramere involute in mid-caudal region, obtuse angled due to excision above; depressed in the cephalo-lateral region, invaginated in the lower anterior inner face producing an acutish tip. Right paramere bilobed, scoop-shaped, extends ventrad and terminates in an obtuse reflexed tip.

FEMALE. Genitalia (pl. 73, no. 12). Subgenital plates about 2.5 mm. across, attingent in the middle, anteriorly slightly diverging, posteriorly sharp angled; distal extremities at sides auriculate. Pubic process composed of a triangular proximal portion and a stem-like distal portion, slightly emarginate at apex, the sides of the proximal portion rounded, the ventro-meson depressed.

Usually constant but sometimes slight variation in pubic process of female genitalia. This species resembles both *forsteri* and *fraterna*, the former in the structure of left paramere, in the involution of the caudal border; however in *forsteri* this area is excised, in *kentuckiana* it is entire. Pubic process of female

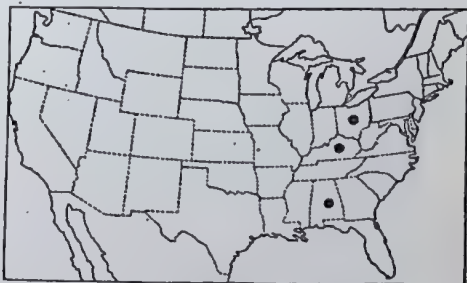


FIGURE 80.—Distribution of *kentuckiana* in the United States.

genitalia in *kentuckiana* in form lies between the two other species, apex usually notched like *fraterna*, sides of proximal region at base less rounded than *fraterna* but more so than in *forsteri*.

Beetles appear in May and June.

Taken in one northern and two southern States (fig. 80).

HOST FAMILIES. 2—Beech, honey-suckle, walnut.

PHYLLOPHAGA OVALIS Cartwright

Phyllophaga ovalis Cartwright, 1939, Ent. Soc. Amer. Ann. 32: 353.

Oblong oval, shining, glabrous, dark castaneous, head darker. Clypeus emarginate; margin moderately reflexed. . . . Antennae 10-jointed. Tooth of claw median, strong, right angled. Length 19 mm., width 11 mm. (Cartwright, 7, p. 353.)

MALE. Mesal region of sterna IV-VI slightly flattened and fluted; VII with a small ridge on either side and transversely depressed behind. Sternum VIII depressed, posterior border pulvinate and slightly emarginate. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, narrower and about one-half as long as the upper spur.

Genitalia (pl. 68, nos. 8-12). Apodeme about 4.5 mm. long, posterior portion deeply transversely depressed, the concave border slightly raised and polished. Phallus asymmetrical; phallobase narrow, collarlike. Left paramere depressed and excavated on dorsum, excised on lower anterior border, long extended distad forming a long acutish tip, the acuteness augmented by a depression on the lower inner face. Right paramere slightly depressed and emarginate on dorsum, broadly and deeply excised on caudolateral area, forming a rather narrow somewhat rounded, mesal pointed distal area; the parameres somewhat resemble a corkscrew from a lateral aspect.

FEMALE unknown.

Only two specimens seen. Taken at DeFuniak Springs, Florida.

PHYLLOPHAGA SCITULA (Horn)

Lachnosterna scitula Horn, 1887, Amer. Ent. Soc. Trans. 14: 256.

Phyllophaga scitula, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Form rather elongate, elytra widest at middle, chestnut brown, head and thorax somewhat darker, shining. Clypeus rather deeply emarginate, the border moderately reflexed. . . . Claws curved, the tooth strong and median. Length 0.70-0.78 inch; 18-20 mm. (Horn, 27, p. 256.)

Antennae 10-segmented.

MALE. (pl. 4, no. 5). Mesal region of sterna IV-VI depressed, dished, sternum VII with a small arcuate, papillose ridge, and a deep, broad transverse depression behind. Sternum VIII broadly and deeply depressed, the posterior border entire, but slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, obtuse, and about one-half as long as the upper acutish spur.

Genitalia (pl. 74, nos. 1-4). Apodeme about 4 mm. long, the posterior portion transversely depressed, the border quite deeply excised. Phallus asymmetrical; phallobase reduced to a thin collar, the subdorsal portion sloping, emphasizing the dorso-mesal area. Left paramere elaborately sculptured, the upper lateral border erose, the outer lateral face markedly depressed, the lower caudal margin excised forming a short acute apex. Right paramere narrower than the left paramere, bearing a hump on the upper lateral border, erose on caudal border, much depressed on outer lateral face, invaginated in the lower cephalic region and terminating in a broadly obtuse apex. On the inner faces near the tips of the parameres there are attingent platelike structures, one on either face.

FEMALE. Genitalia (pl. 74, nos. 5 and 6). Subgenital plates about 2.5 mm. across, unsculptured, depressed along mesal line, distal borders on meson spinose; the plates almost surround the base of the process. Pubic

process broadly clavate basad, terminating distad in rounded apices.

Superficially resembles a small *knochii* in color of elytra, in density and coarseness of punctures on thorax, frons, and clypeus.

Beetles appear in April and May. Taken in Texas and Oklahoma. Not common.

PHYLLOPHAGA KNOCHII
(Schoenherr and Gyllenhal)

Melolontha knochii Schoenherr and Gyllenhal, 1817, *Synonymia Insectorum* (Schoenherr), t. I, pt. 3, Appendix p. 75. *Phyllophaga knochii*, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Elongate oval, very little broader behind, ferruginous brown to piceous, feebly shining. Clypeus rather broadly and moderately deeply emarginate, the border scarcely reflexed. . . . Claws curved, the tooth strong and median, a little longer in female. Length 0.85–0.92 inch; 21.5–23.5 mm. (Horn, 27, p. 257.)

Antennae 10-segmented.

MALE. (pl. 8, no. 5). Mesal region of sterna IV–VI slightly flattened; VII with a deep transverse papillose depression, the anterior rim of the depression elevated on the sides. Sternum VIII markedly and broadly depressed, the depression bean-shaped, the posterior border slightly concave with narrow, acute incision in meson (pl. 10, no. 5). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, obtuse, and about one-half as long as the acute upper spur.

Genitalia (pl. 72, nos. 1–5). Apodeme 7 mm. long, the posterior portion transversely depressed, its border raised but straight. Phallus asymmetrical; phallobase reduced to a collar. Parameres widely spreading. Left paramere thin, conchate, upper caudal portion slightly involute, the ventral face invaginated producing a blunt tip; antero-dorsal region markedly depressed. Right paramere narrow, involute on venter producing a bilobed structure scoop-shaped from the rear, with a blunt tip bent ventrad; antero-dorsal region somewhat depressed.

FEMALE. Posterior portion of sternum VIII narrowly transversely arcuately depressed, the border slightly concave.

Genitalia (pl. 72, nos. 6 and 7). Subgenital plates 2.5 mm. wide, suture distinct, with auriculate concavity on each side at the distal end, caudal margins of concavities excised to receive the pubic process. Pubic process on ventral aspect flask-shaped, composed of a broad proximal portion with rounded sides and a short narrow distal portion, emarginate at apex; ventral region deeply depressed.

Constant in form, size, shape and color. Although usually free from vestiture, two females and one male, quite hairy, have been collected at Albany, Ga.

Beetles appear from latter part of March to July.

Mostly a species of southeastern States (fig. 81). Has never been found in any great numbers, hence of little economic importance at this time.

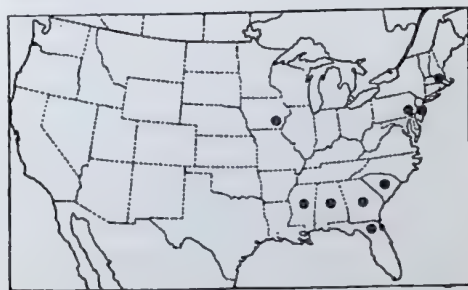


FIGURE 81.—Distribution of *knochii* in the United States.

HOST FAMILIES. 2—Beech, elm, maple, planetree, rose, walnut.

PHYLLOPHAGA BARDA (Horn)

Lachnosterna barda Horn, 1887, *Amer. Ent. Soc. Trans.* 14: 248.

Phyllophaga barda, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 373.

Oblong-oval, rather robust, above slightly depressed, piceous, shining. Clypeus distinctly emarginate, the border very slightly reflexed. . . . Claws with a median tooth, small in the male, long in the female.

Length 0.82–0.86 inch; 21–22 mm. (Horn, 27, p. 248.)

Antennae 10-segmented.

MALE. (pl. 6, no. 3). Mesal region of sterna IV–VI broadly flattened, dished; VII transversely arcuately ridged, much depressed behind and undermining the ridge at the sides. Sternum VIII deeply depressed, the posterior border undulating. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper. Both spurs slender and acutish.

Genitalia (pl. 23, nos. 1–4). Apodeme about 5 mm. long, posterior portion broadly but only slightly depressed, the border deeply concave. Phallus asymmetrical, elaborately sculptured; phallobase moderately broad. Parameres each composed of an upper and lower lobe. Left paramere: the upper lobe conchate, deeply incised in the dorso-lateral region, forming a ladle-like process and excised on mid-caudal border forming a dentate process bent mesad; the lower lobe somewhat fluted at junction of upper and lower lobes in caudal region, depressed laterally, thus producing a ledge, excised in the lower cephalo-lateral region producing a blunt tip. Right paramere: the upper lobe similarly sculptured and similar in form to that of the left paramere, mid-caudal border also bears a dentate process; lower lobe quite distinct from lower lobe of left paramere, lateral side is deeply depressed particularly in the upper lateral area, extended ventrad and terminating in a bilobed tip, the upper lobe being rounded, the lower being truncate.

FEMALE. Posterior border of sternum VIII slightly convex.

Genitalia (pl. 23, nos. 5 and 6). Subgenital plates about 2 mm. wide, attinent in middle, sloping posteriorly, disclosing pubic process and terminating distad in truncate apices.

Pubic process platelike, rounded on sides and base, depressed in middle, emarginate in distal extremity producing an obtuse bilobed apex.

Constant in form, size and male phallic structures; some variation in color from reddish brown to black, also slight variation in form of pubic process in female genitalia.

Adults appear from latter part of March to July.

Taken in much of the area in the eastern half of the United States (fig. 82). Not common.



FIGURE 82.—Distribution of *barda* in the United States.

HOST FAMILIES. 2—Beech, ebony, heath, walnut. 3—Willow.

PHYLLOPHAGA FORSTERI (Burmeister)

- Ancylonycha forsteri* Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 325.
Lachnosterna semicribrata LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 247.
Lachnosterna lugubris LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 248.
Lachnosterna lutescens LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 249.
Lachnosterna politula Horn, 1887, Amer. Ent. Soc. Trans. 14: 248.
Lachnosterna nova Smith, 1889, Ent. Amer. 5: 95.

Phyllophaga forsteri, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong-oval, castaneous, slightly polished. Clypeus moderately emarginate, the border moderately reflexed. Antennae 10-segmented. Claws broadly arcuate with a median, well-developed tooth. Length 16.3 mm.; width 8.5 mm.

MALE. Mesal region of sterna IV–VI flattened; VII with a papillose transverse arcuate ridge, broadest on

meson, on sides depressed in front. Sternum VIII deeply depressed, the caudal border slightly concave (pl. 9, no. 5). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper.

Genitalia (pl. 74, nos. 7-11). Apodeme 3 mm. long, with a transverse moderate depression in the posterior region, posterior border slightly concave. Phallus asymmetrical; phallobase narrow, collarlike. Parameres well developed. Left paramere with an involute somewhat flattened upper caudal portion having a circular excavation on the upper caudal border; the size of the cut-out area varies greatly in different specimens, sometimes the meson is shallow, at other times very deep; latero-ventral portion somewhat invaginated, producing a pointed tip, bent cephalad. Right paramere involute on the under side of the lower caudal region, the involute area extended, producing a bilobed structure somewhat scoop-shaped with an obtuse tip.

FEMALE. Genitalia (pl. 74, no. 12). Subgenital plates about 2 mm. wide, attinent on meson, terminating in sharp obtuse protuberances distad, outer posterior portions thinner and with auriculate depressions near border; in some specimens these ear-like depressions are much reduced. Pubic process ladle-shaped, broad portion proximad, lower borders of proximal portion trifle rounded and the area in between considerably depressed, forming the bowl of the ladle, the depression sometimes extends part way up the stem. Stem bent dorsad and slightly emarginate at apex.

Fairly constant in form and shape but sometimes unequal in size and with slight variations in genital structures as noted in descriptions above. Adults appear from about first part of April to first part of July.

Occurs generally throughout the eastern half of the United States (fig. 83). A common species in some southeastern States.

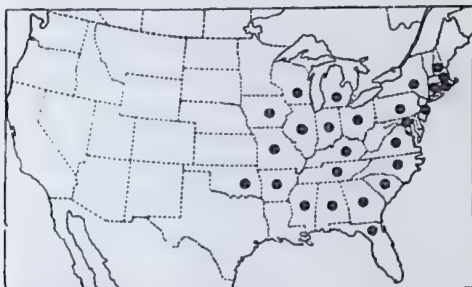


FIGURE 83.—Distribution of *forsteri* in the United States.

HOST FAMILIES. 2—Beech, bignonia, birch, ebony, elm, grass, heath, honeysuckle, laurel, lily, magnolia, maple, pine, pulse, rose, rue, saxifrage, sumac, tupelo, walnut, willow, witchhazel. 3—Beech, elm, laurel, olive, pine, rose, walnut, witchhazel.

Phyllophaga tecta Cartwright (8, p. 32) (pl. 75, nos. 1-4 ♂; nos. 5 and 6 ♀).

Similar to *forsteri* superficially but more robust. Differs in having upper portion of left paramere of phallus entire, not incised as in *forsteri*. Pubic process of female similar. Recorded from Florida.

PHYLLOPHAGA PROFUNDA (Blanchard)

Ancylonycha profunda Blanchard, 1850, Catalogue de la Collection Entomologique du Museum d'Histoire Naturelle de Paris, Tome I, p. 132.

Lachnosterna bimpressa Smith, 1889, Ent. Amer. 5: 97.

Lachnosterna grandior Linell, 1896, U. S. Natl. Mus. Proc. 18: 727.

Phyllophaga profunda, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, slightly broader behind, moderately robust, shining, castaneous. Clypeus broadly, moderately deeply emarginate, margin narrowly reflexed. . . . Claws curved, the tooth stout, long and median. Length 0.80-0.90 inch; 20-23 mm. (Horn, 27, p. 257.)

Antennae 10-segmented.

MALE. (pl. 4, no. 11). Mesal region of sterna IV-VI slightly dished; VII transversely crossed with a granulose, arcuate ridge, deeply depressed behind, rugose on the sides in front. Sternum VIII moderately depressed with an indication of an emargination of the posterior border (pl. 9, no. 7). Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper spur.

Genitalia (pl. 71, nos. 1-4). Apodeme about 7 mm. long, transversely depressed in posterior portion, the border undulating. Phallus asymmetrical; phallobase very narrow. Left paramere conchate, the larger of the two, deeply excavated in the dorso-lateral region, slightly invaginated in the caudo-ventral region, producing a blunt tip. Right paramere moderately depressed on the dorso-lateral region, markedly involute in the caudo-ventral region, producing an inner secondary lobe and a somewhat truncate tip.

FEMALE. Posterior border of sternum VIII with a broad excision on meson.

Genitalia (pl. 71, no. 5). Subgenital plates about 3 mm. across, attinent at the middle of the meson, moderately diverging anteriorly, less so posteriorly with rather sharp distal points on meson and auriculate depressions on the sides. Pubic process composed of a broad rounded basal portion and two rather widely

diverging stems with rounded apices, somewhat fluted on the ventro-meson; process almost at right angles to plates when *in situ*.

Constant in all respects.

Beetles active from middle of March to middle of July.

Taken mostly in the south-central part of the United States (fig. 84). Common in some sections.

HOST FAMILIES. 2—Beech, ebony, elm, laurel, planetree, pulse, rose, walnut, willow.

PHYLLOPHAGA MARGINALIS

(LeConte)

Lachnosterna marginalis LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 250.

Phyllophaga marginalis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Oblong, very little broader behind, rufocastaneous to brown, shining. Clypeus moderately emarginate, the border very narrowly reflexed. . . . Claws arcuate, strongly toothed at middle. Length 0.65-0.85 inch; 16.5-21.5 mm. (Horn, 27, p. 250.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV-VI flattened, slightly dished; VII with a short transverse, arcuate scabrous ridge behind which is a slight depression. Sternum VIII slightly depressed, the posterior border undulating. Antennal club somewhat longer than the stem. Lower spur of hind tibia stout, unarticulated and about two-thirds as long as the more slender upper spur.

Genitalia (pl. 75, nos. 7-11). Apodeme about 4 mm. long with a marked transverse depression in the posterior region, posterior border excised. Phallus asymmetrical; phallobase reduced to a narrow collar. Left paramere rather broad, flat, with dorso-caudal border involute, particularly in the proximal region, invaginated on lower inner face, depressed in the dorso-caudal region of the inner face, terminating into an acute tip bent ventrad. Right paramere narrower than left, depressed on lateral face, with a circular incision on lower lateral border; the caudal region



FIGURE 84.—Distribution of *profunda* in the United States.

invaginated in the lower inner face, depressed on the dorso-caudal region of the inner face and terminating into an obtuse tip bent ventrad. Arising from the base of the lower inner face of either paramere is a protuberance; the protuberances converge. From the rear the structure has a fluted appearance.

FEMALE. Genitalia (pl. 36, no. 12; pl. 75, no. 12). Subgenital plates about 1 mm. across and about twice as long, depressed along the prominent suture line; in distal region, plates form a cup-like depression into which the process fits snugly. Pubic process consists of two broad, flat stems united for one-half length of proximal region, diverging markedly distad, and terminating into truncate twisted apices.

Constant in color, form, and genital characters.

Beetles appear from early March to middle of July.

Occurs in eastern half of the United States (fig. 85), and in two of the Canadian provinces. Apparently not common. Probably a woodland species.



FIGURE 85.—Distribution of *marginalis* in the United States.

HOST FAMILIES. 2—Beech, olive, pine, walnut. 3—Beech, elm, laurel, rose, walnut. Canada—Witchhazel.

Phyllophaga marginalis var. *insolita* Cartwright (8, p. 33).

Differs from *marginalis* only superficially. It lacks polish, is more conspicuously punctured on dorsum,

and is hairy. Genitalia are similar. Occurs in Alabama.

PHYLLOPHAGA FLORIDANA

Robinson

Phyllophaga floridana Robinson, 1938, Amer. Ent. Soc. Trans. 64: 110.

Oblong, rufotestaceous, fuscous; shining. Clypeus moderately deeply emarginate, narrowly reflexed. . . . Antennae 10-segmented. Tooth of tarsi fairly long, triangular, median. Length, 18 mm.; breadth, 9 mm. (Robinson, 53, p. 110.)

MALE. Mesal region of sterna IV-VI broadly flattened; VII granulose, slightly ridged in the middle, more pronounced on sides, slightly depressed behind ridge. Sternum VIII broadly depressed, posterior border slightly concave. Antennal club somewhat shorter than stem. Lower spur of hind tibia unarticulated, about two-thirds as long as the upper.

Genitalia (pl. 76, nos. 1-4). Apodeme about 4 mm. long, posterior portion deeply transversely depressed, the slightly concave border raised and rounded. Phallus asymmetrical; phallobase reduced to a collar, lower caudal border invaginated producing a conspicuous tuberculate process. Left paramere conchate, the upper cephalo-lateral border depressed, the lower invaginated producing an obtuse tip. Right paramere aborted and flattened, terminating in a broadly obtuse recurvate tip; lower half of the caudal area of this paramere adorned with a thin shell-like extension.

FEMALE. Genitalia (pl. 76, nos. 5 and 6). Subgenital plates about 2 mm. across, attinent and depressed in the middle, anteriorly slightly diverging, posteriorly sharp pointed on sides; at distal end deeply excavated. Pubic process composed of a round, proximal portion, with a deeply depressed ventro-meson, a flat dorsum and a stem-like distal portion emarginate at apex.

Adults appear in June.

Taken in Georgia and Florida, Rare.

HOST FAMILIES. 2—Beech, ebony, tupelo.

PHYLLOPHAGA CURIALIS Reinhard

Phyllophaga curialis Reinhard, 1939, Kans. Ent. Soc. Jour. 12: 54.

Form oblong, oval, wider behind, dark brown to piceous, apparently glabrous above, surface moderately shining. Clypeus flattened, rather deeply emarginate. . . . Antennae with ten segments. Tooth of claw stout, long, acute, median. Length, 19 mm.; width, 10 mm. (Reinhard, 48, p. 54.)

MALE. Mesal region of sterna IV-VI moderately depressed; VII somewhat plicate on sides and transversely depressed along posterior border. Sternum VIII markedly depressed, somewhat fluted posteriorly, the posterior border slightly emarginate. Antennal club somewhat shorter than the stem. Lower spur of hind tibia arcuate, about two-thirds as long as the upper spur, unarticulated; both obtuse.

Genitalia (pl. 76, nos. 7-10). Apodeme about 3 mm. long, posterior portion markedly transversely depressed, and longitudinally somewhat fluted, the border entire. Phallus asymmetrical; phallobase reduced to a collar. Left paramere conchate, invaginated in the lower cephalo-lateral region and ending in an obtuse tip. Right paramere scoop-shaped, the outer lobe narrow and invaginated in the lower cephalo-lateral border, the inner lobe prominent, the caudal border flattened, producing a tip more obtuse than that of left paramere.

FEMALE. Genitalia (pl. 76, no. 11) Subgenital plates about 2 mm. across, attingent in the middle, auriculate on the sides of the posterior region producing obtuse terminal processes above which the pubic process originates. Pubic process ladle-shaped with a broad excised proximal portion having rounded sides and a narrow constricted distal portion, slightly emarginate at apex.

Beetles active in May and June.

Occurs in the south-central and southwestern parts of the United States (fig. 86). Rare.

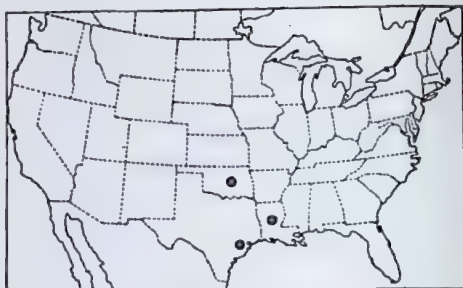


FIGURE 86.—Distribution of *curialis* in the United States.

PHYLLOPHAGA DRAKII (Kirby)

Rhizotrogus drakii Kirby, 1837, Fauna Boreali-Americana (Richardson, J.), Part 4, Insects, p. 133.

Lachnosterna consimilis Le Conte in Agassiz, 1850, Lake Superior, Its Physical Character, Vegetation, and Animals, p. 226.

Lachnosterna grandis Smith, 1888, Insect Life 1: 181.

Phyllophaga drakii, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 371.

Oblong, subdepressed, castaneous, polished. Antennae 10-segmented. Clypeus emarginate, the margin reflexed. Claws arcuate with a strong median tooth. Length 22.5 mm.; width 11.3 mm.

MALE. (pl. 8, no. 6). Mesal region of sterna IV-VI flattened, slightly dished; VII conspicuously transversely ridged, the ridge granulose, rounded in front, somewhat precipitous behind. Sternum VIII broadly depressed, sometimes deeply, on meson, the depression granulose, posterior border entire. Antennal club about as long as the stem. Lower unarticulated spur of hind tibia about two-thirds as long as the upper spur.

Genitalia (pl. 77, nos. 1-4 and 6). Apodeme about 6 mm. long, posterior portion eroded, the border raised and concave. Phallus, symmetrical; phallobase narrow. Parameres well developed, narrowly united on dorsum, the cephalo-lateral and ventral areas depressed, particularly the latter, thus forming rather broad round-

ed caudo-lateral borders, which terminate in truncate apices attingent on the upper angles; distal opening, ovate.

FEMALE. Genitalia (pl. 77, no. 5). Subgenital plates about 4 mm. across, deeply depressed across the middle, cephalad of depression, attingent, caudad, separated, disclosing basal portion of pubic process; distal portion of plates with cupuliform depressions. Pubic process composed of rounded stemlike, curved proximal and two widely diverging distal portions, somewhat bent ventrad, terminating either in rounded or truncate apices; in outline process resembles letter Y.

Variable superficially in size and in color from reddish-brown to black; also slight variation in genital characters both in male and female. In the male, caudo-lateral borders vary in width, apices sometimes emarginate; the apex of the left paramere sometimes impressed. In the female, distal portion of the process sometimes slender and curved mesad.

Adults appear from middle of March through July.

Widely distributed; taken in a large portion of the eastern United States (fig. 87), and in several of the Canadian provinces (fig. 88). A common species in some areas and the grubs are destructive to crops.

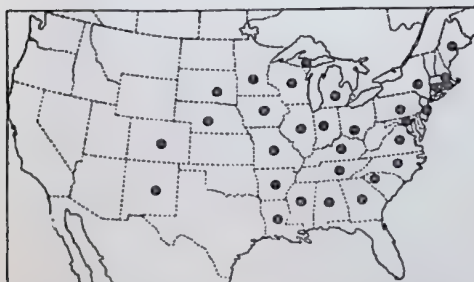


FIGURE 87.—Distribution of *drakii* in the United States.

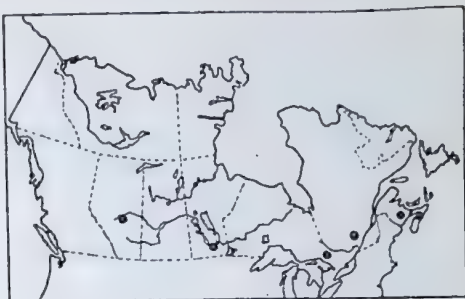


FIGURE 88.—Distribution of *drakii* in Canada.

HOST FAMILIES. 1—Rose. 2—Beech, birch, calycanthus, dogwood, maple, pulse, rose, tupelo, witchhazel. 3—Basswood, beech, birch, dogwood, elm, honeysuckle, maple, rose, willow, witchhazel.

PHYLLOPHAGA GRACILIS (Burmeister)

Trichestes gracilis Burmeister, 1855, Handb. der Ent., Bd. 4, Abt. 2, p. 361.

Endrosa volvula LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 235.

Lachnosterna inana LeConte, 1856, Acad. Nat. Sci. Phila. Jour. 3 (ser. 2): 242.

Phyllophaga gracilis, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 372.

Elongate, cylindrical, pale rufotestaceous, thorax somewhat darker, head fuscous or piceous. Head broad, eyes large, especially in the male. Clypeus short, deeply emarginate, margin not widely reflexed. . . . Claws feebly curved, the tooth small and nearly median. Length 0.41–0.52 inch; 10.5–13 mm. (Horn, 27, p. 230.)

Antennae 10-segmented.

MALE. (pl. 7, no. 3). Mesal region of sterna IV–VI slightly flattened; VII usually diagonally rugose on the sides and narrowly transversely depressed along the posterior border. Sternum VIII more or less depressed, posterior border slightly concave. Antennal club about as long as the stem. Lower spur of hind tibia about as long as the upper spur, unarticulated, obtuse, somewhat twisted and curved.

Genitalia (pl. 65, nos. 1–3). Apodeme about 3 mm. long, depressed in the posterior region, posterior border rather deeply concave. Phallus symmetrical, the dorsum of the anterior

border deeply excised; phallobase broad. Membranous area somewhat circular. Parameres extend anteriorly and ventrally, finally ending in very long pointed somewhat recurvate apices; anterior portion of each paramere is extended ventrad ending in a short blunt tip; caudal borders rounded; distal opening somewhat circular, extending slightly on to the dorsum, making a sharp angle on the meson.

FEMALE. Genitalia (pl. 65, no. 7). Subgenital plates small, attinent in anterior region, diverging distad, unsculptured. Pubic process composed of a broad, flat somewhat circular proximal portion from the tip of which arises a short thickish biramous stem.

Fairly constant in superficial characters; some variation in male phallic structure particularly in degree of flare of the caudal border of the parameres.

Adults appear from latter part of June to middle of August.

Taken in a large part of eastern United States (fig. 89), in Idaho, and in the Province of Ontario, Canada. Fairly common in some localities.

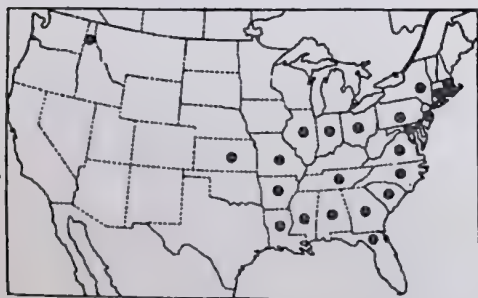


FIGURE 89.—Distribution of *gracilis* in the United States.

HOST FAMILIES. 2—Beech, bigonia, ebony, elm, grass, honeysuckle, planetree, pulse, rose, tupelo, vine, walnut, willow, witchhazel.

Phyllophaga gracilis var. *angulata* Glasgow (23, pp. 294–296).

Similar to *gracilis* except in the structure of the phallus. This has a flared caudal border in *angulata* (pl. 65, nos. 4–6), a rounded caudal border in *gracilis* (pl. 65, nos. 1–3). The hamate processes of the phallus are considerably longer in *angulata* than in *gracilis*.

Taken in a number of states in the eastern part of the United States (fig. 90).



FIGURE 90.—Distribution of *gracilis* var. *angulata* in the United States.

HOST FAMILIES. 2—Beech, ebony, laurel, pulse, walnut.

PHYLLOPHAGA KARLSIOEI (Linell)

Lachnosterna karlsioei Linell, 1897, U. S. Natl. Mus. Proc. 19: 400.

Phyllophaga karlsioei, Glasgow, 1916, Ill. Nat. Hist. Survey Bul. 11 (art. 5): 374.

Robust, oblong, parallel, rufopiceous, very shining. Clypeus very wide, distinctly emarginate . . . margin moderately reflexed . . . Claws strongly curvate, with a strong median tooth. Length, 25 mm. (Linell, 41, p. 400.)

Antennae 10-segmented.

MALE. Mesal region of sterna IV–VI flattened, dished; VII with a lunate ridge, sloping in front, declivitous behind. Sternum VIII flattened, granulose, posterior border unindented. Antennal club about as long as the stem. Lower spur of hind tibia unarticulated, obtuse and about three-fourths as long as the acute upper spur.

Genitalia (pl. 77, nos. 7–10). Apodeme about 4 mm. long, depressed in the posterior region, the border unindented and ridged. Phallus nearly

symmetrical; phallobase very narrow. Parameres with depressions beginning in the upper lateral regions extending downward and on to the venter where they become much emphasized, forming shelf-like caudal borders and terminating in bifurcate apices, the inner sometimes attinent; distal opening almost circular.

FEMALE. Genitalia (pl. 77, no. 11). Subgenital plates about 3.5 mm. broad, attinent on meson with a deep transverse invagination near the distal end from the middle of which the pubic process arises; distal portion of plates depressed. Pubic processes biclavate basad, inserted for half their length and connate, exerted portions somewhat diverging and terminating in rounded apices.

Species resembles *ulkei* in superficial characters and also in genital structures. However, *karlsioei* is larger, darker in color and not so glossy as *ulkei*. In the male phallic char-

acters the parameres are smaller and more irregular in *karlsioei* than in *ulkei*. The pubic process of the female genitalia of *karlsioei* has diverging stems, in *ulkei* the stems are more nearly parallel.

Adults appear from March to May.

Taken in South Central States (fig. 91).



FIGURE 91.—Distribution of *karlsioei* in the United States.

HOST FAMILIES. 2—Tupelo, walnut.

ADDENDA

In these addenda are included notes on some species, some of which were not available for study, doubtful species and notes on species often included with the *Phyllophaga* of the United States, but which have not been taken within its boundaries and are therefore excluded from the main text of this treatise.

1. Four species—*nitidula* LeConte (39, p. 77), *maculicollis* LeConte (39, p. 76), *contaminata* Fall (19, pp. 197–198), *extranea* Fall (19, pp. 198–199)—often included with the American species, have to the knowledge of the writers not been taken in the United States, but were collected and described from specimens taken in Baja California.

2. *Phyllophaga chippewa* Saylor, described by Saylor (63, p. 455) from one male specimen taken in Schley, Minn., by L. W. Orr. It closely resembles *knocchi* in external character but differs somewhat in the structure of the genitalia, possibly due to an abnormality.

3. *Phyllophaga ecostata* Horn, described

by Horn (27, p. 284) from one specimen collected in alcohol. The habitat is southwestern Texas. J. B. Smith (72, p. 521) commented on this species, and illustrated the male genitalia on Plate LX, fig. 83. This species has recently been placed in the genus *Tridonyx* by Saylor (65, pp. 158–159).

4. *Phyllophaga xerophila* Saylor, described by Saylor (64, p. 89) from a male specimen taken by him in San Bernardino County, Calif., April 1935. According to Saylor this species is similar to *reevesi* in external characters. This specimen was not available for study, but the genitalia were photographed (pl. 78, nos. 5–8).

5. *Phyllophaga reevesi* Saylor, described by Saylor (64, p. 88) from a male specimen taken by him in Death Valley, Calif., April 1935. This specimen was not available for study but the genitalia were photographed (pl. 78, nos. 1–4).

6. *Phyllophaga yemasseei* Cartwright, described from one specimen collected at Yemassee, S. C., June 6, 1941, by O. L. Cartwright (8, pp. 30–32). This specimen was not available for study but according

to Cartwright this form is closely allied to *P. debilis* LeConte with some minor differences, particularly in the genitalia.

7. *Phyllophaga hubbelli* Cartwright. This valid species, described by Cartwright (9, pp. 10-12) is elongate, subcylindrical, parallel, and glabrous. The antennae are 9-

segmented, the clypeus deeply emarginate. Lower spur of hind tibia articulated, about one-half as long as the upper spur. The phallus is symmetrical, the parameres concave, nearly straight edged on venter. It has been taken in Alabama and Georgia. Food plants are oak and hickory.

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1. *uniformis*



2. *vehemens*



3. *micans*



4. *torta*



5. *hirticula*



6. *infidelis*



7. *farcta*



8. *futilis*



9. *glaberrima*



10. *implicita*



11. *hamata*



12. *calceata*



13. *ephilida*



14. *fusca*



15. *hirtiventris*



16. *farcta*



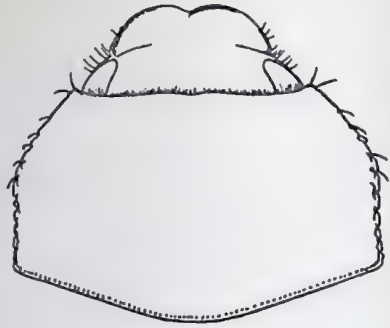
17. *soror*

Types of hind tibial spurs. $\times 5$.
Types of claws. $\times 10$.

1. Upper spur long, slender, acute. Lower spur aborted. (*uniformis*)
 2. Upper spur long, slender, truncate. Lower spur hooked at tip. (*vehemens*)
 3. Upper spur long, slender, obtuse. Lower spur decurved, arcuate. (*micans*)
 4. Upper spur wedge-shaped, obtuse. Lower spur hamate, truncate. (*torta*)
 5. Upper spur long, acute. Lower spur short, acute. (*hirticula*)
 6. Upper spur long, acute. Lower spur very short, broad, acute. (*infidelis*)
 7. Upper spur short, broad, obtuse. Lower spur short, broad, truncate. (*farcta*)
 8. Upper spur long, obtuse. Lower spur, boot shaped. (*futilis*)
 9. Upper spur long, acute. Lower spur, short dentate. (*glaberrima*)
- (Legend continued on following page.)



18. *tristis*



19. *prunina*



20. *lanceolata*



21. *sequoiana*

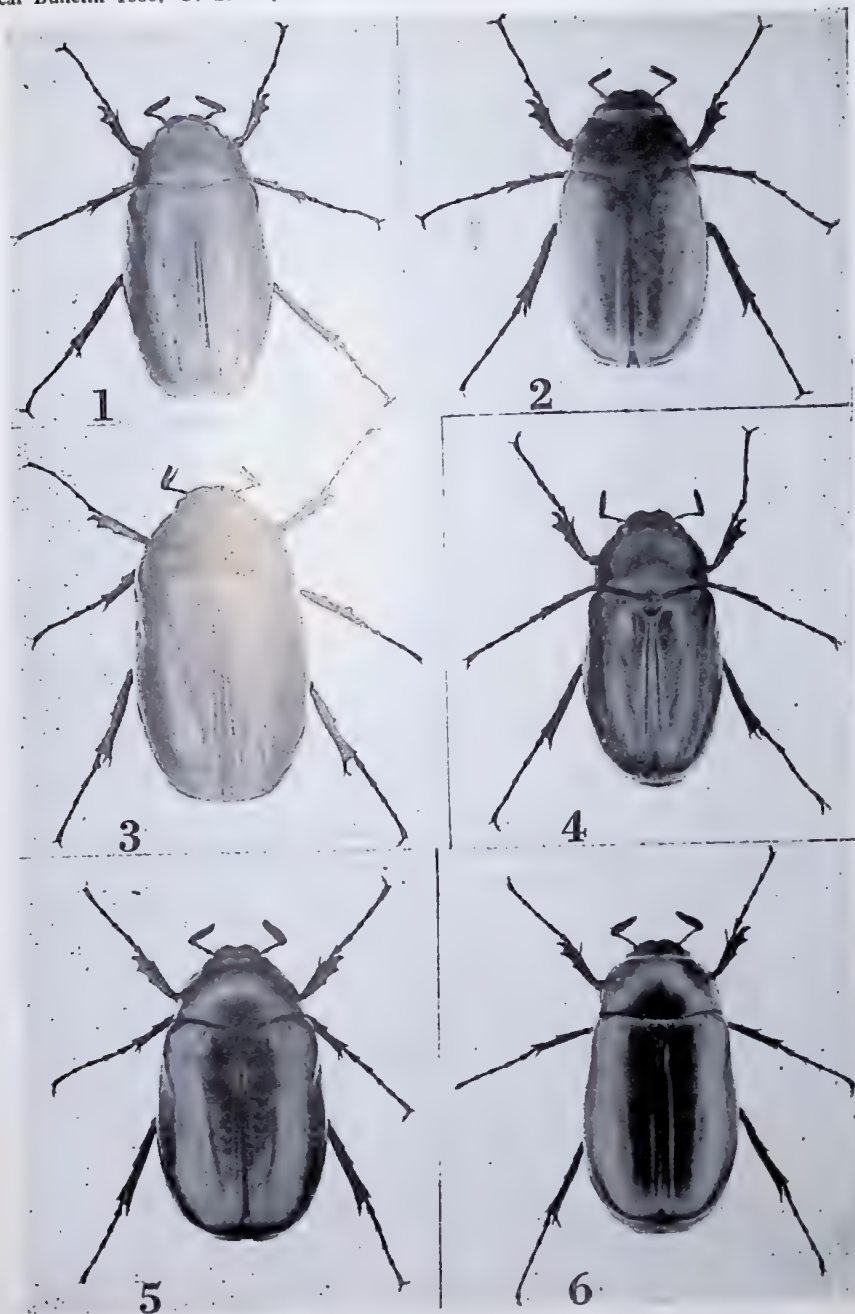


22. *longitarsa*

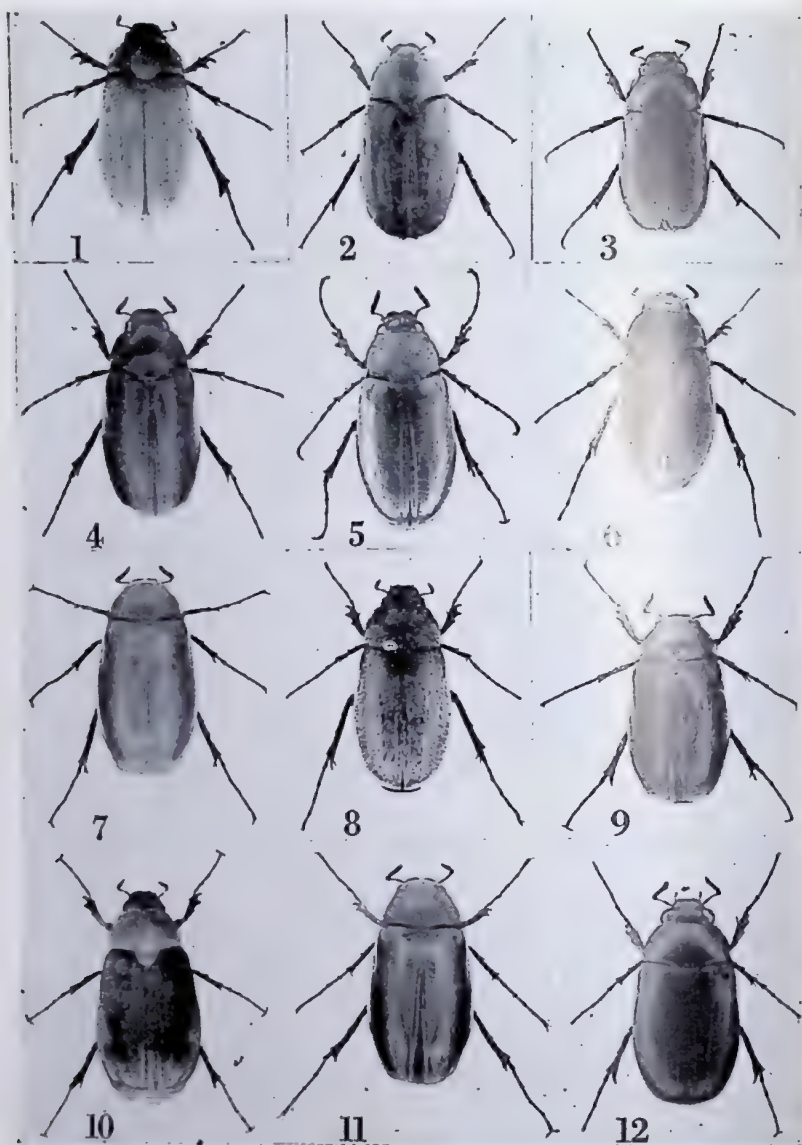
A.ushman

Types of clypeal forms. x 3.

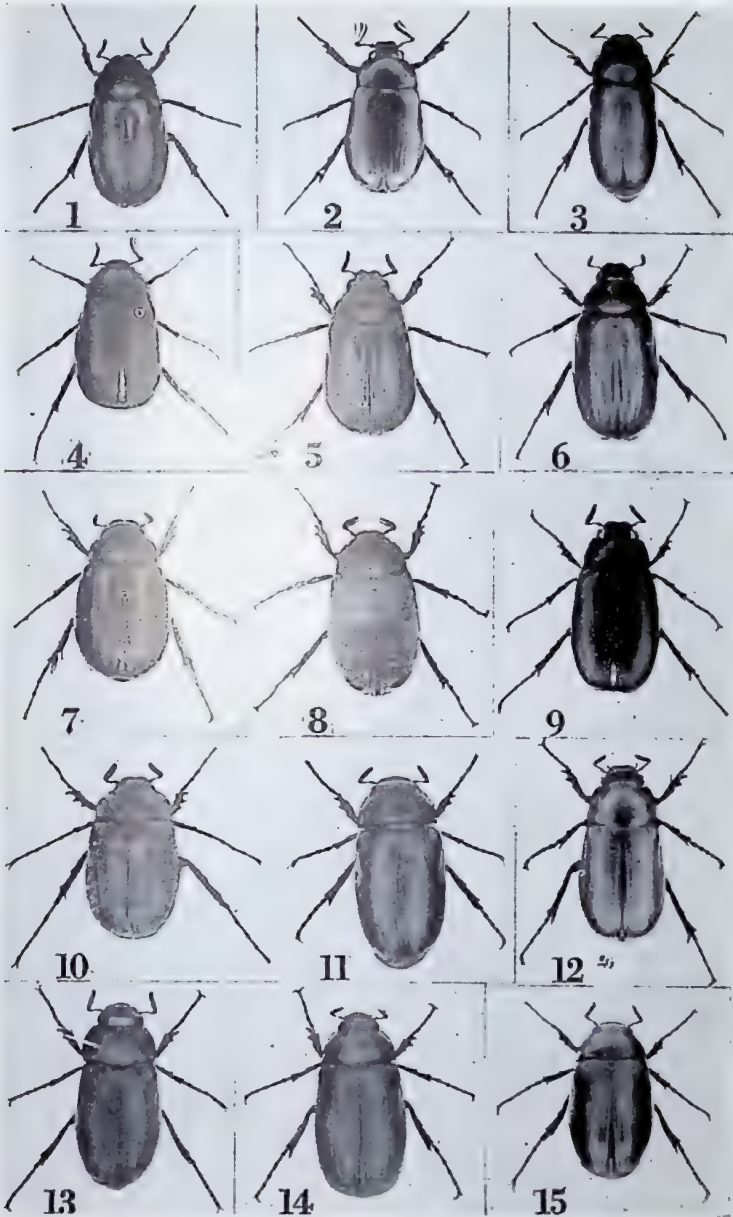
10. Upper spur long, acutish. Lower spur short, curved. (*implicita*)
11. Upper spur very short, acutish. Lower spur long, hamate, acute. (*hamata*)
12. Upper spur short, acute. Lower spur short, broad, obtuse. (*calceata*)
13. Upper spur long, slender, acute. Lower spur very short, obtuse. (*ephipilida*)
14. Claw with median tooth. (*fusca*)
15. Claw with extramedian tooth. (*hirtiventris*)
16. Claw with intramedian tooth (*farcta*)
17. Claw with subbasal tooth. (*soror*)
18. Clypeus entire. (*tristis*)
19. Clypeus broadly but not deeply emarginate. (*prunina*)
20. Clypeus sinuate. (*lanceolata*)
21. Clypeus sub-truncate. (*sequoiana*)
22. Clypeus deeply emarginate. (*longitarsa*)



Adults of *Phyllophaga* species: 1, *fusca*, 2, *ilicis*, 3, *vehemens*, 4, *hornii*, 5, *anxia*, 6, *fervida*. $\times 1\frac{3}{4}$.



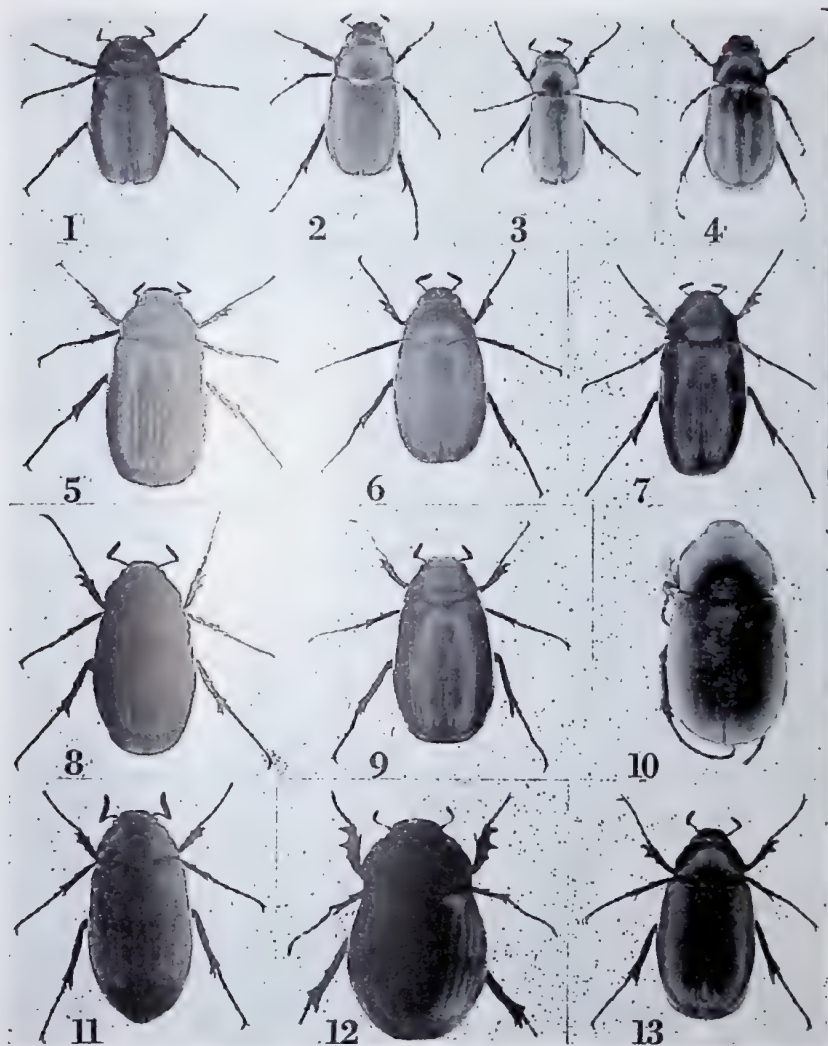
Adults of *Phyllophaga* species: 1, *rubiginosa*. 2, *nitida*. 3, *ephilida*. 4, *crassissima*. 5, *scitula*. 6, *submucido*. 7, *ulkei*. 8, *crenulata*. 9, *congrua*. 10, *prunina*. 11, *profunda*. 12, *hirtiventris*. x 13½.



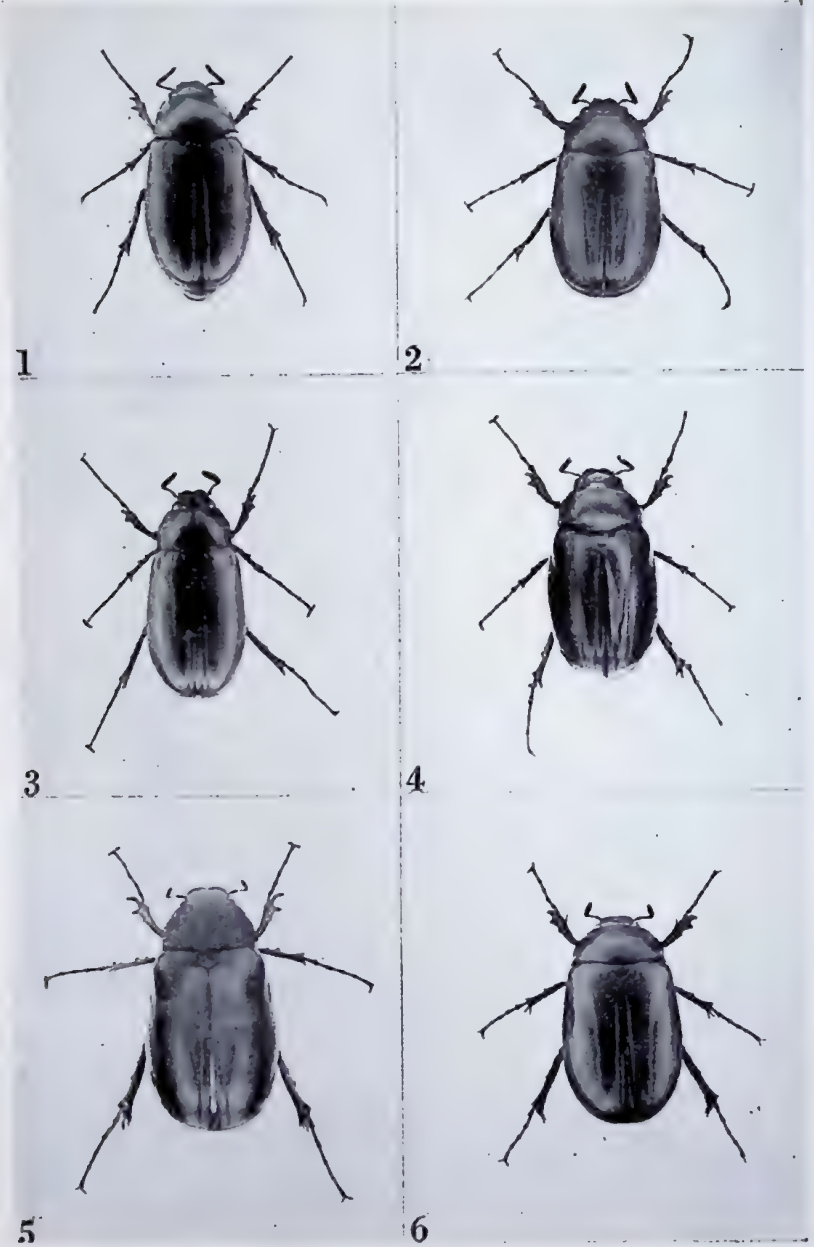
Adults of *Phyllophaga* species: 1, *futilis*. 2, *aurea*. 3, *glabricula*. 4, *crinita*. 5, *implicita*. 6, *fraterna*. 7, *diffinis*. 8, *micans*. 9, *balia*. 10, *lanceolata*. 11, *lota*. 12, *dentex*. 13, *latifrons*. 14, *clypeata*. 15, *prununculina*. x 1½.



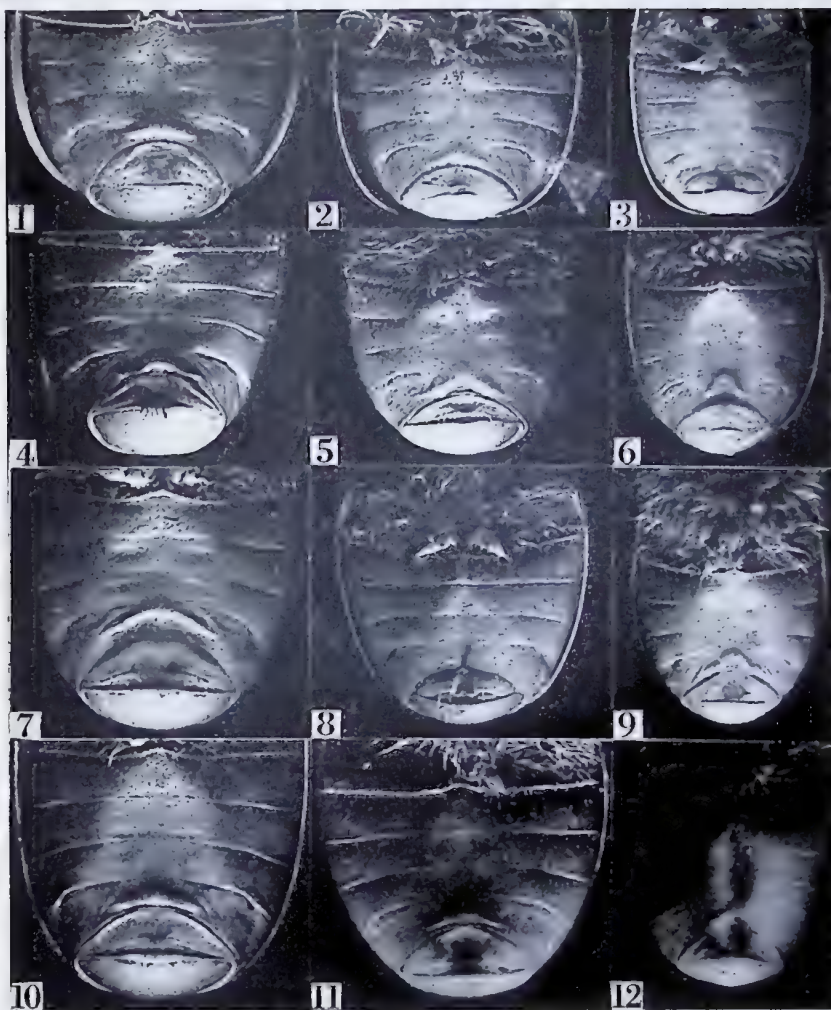
Adults of *Phyllophaga* species: 1, *hirticula*. 2, *praetermissa*. 3, *barda*. 4, *sequoiana*. 5, *tristis*. ($\times 2\frac{2}{3}$). 6, *perlonga*. $\times 1\frac{1}{4}$.



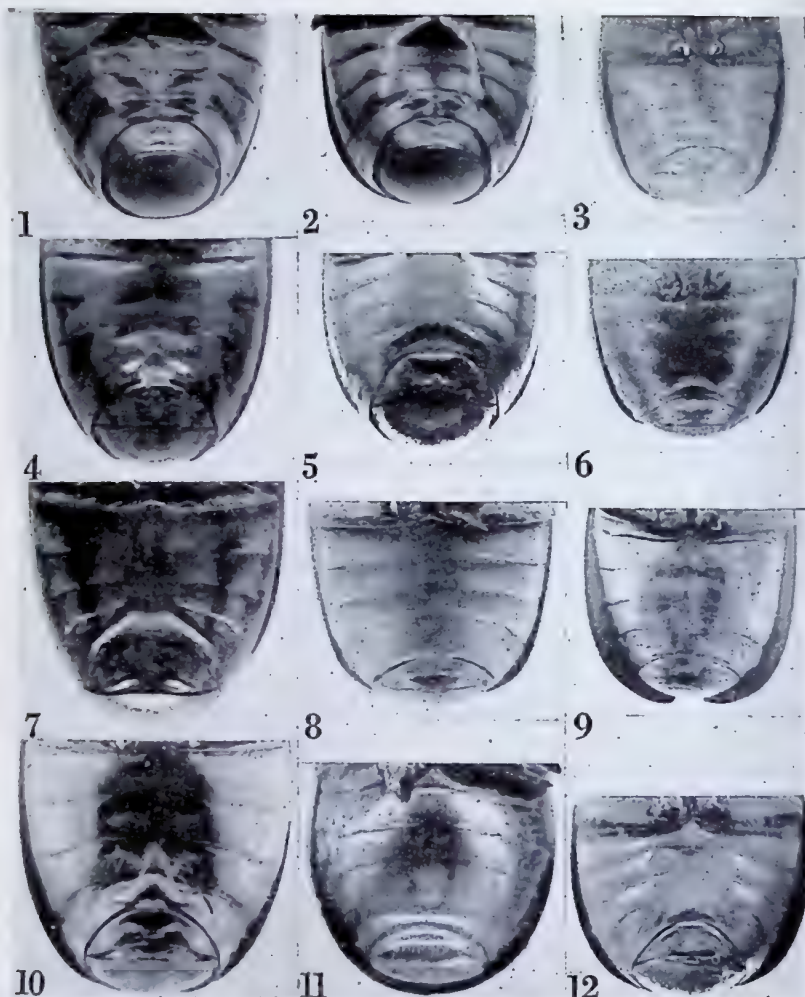
Adults of *Phyllophaga* species: 1, *uniformis*. 2, *inopia*. 3, *gracilis*. 4, *latidens*. 5, *bipartita*. 6, *subpruinosa*. 7, *glaberrima*. 8, *infidelis*. 9, *foxii*. 10, *farcta*. 11, *spreti*. 12, *cribrosa*. 13, *corrosa*. x 1 $\frac{1}{2}$.



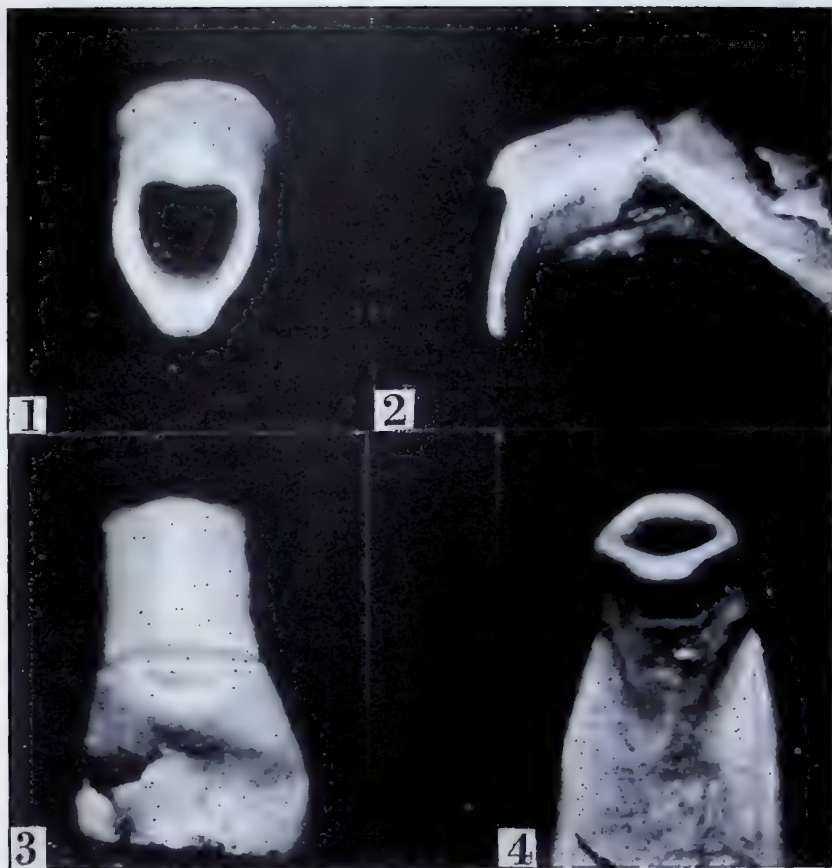
Adults of *Phyllophaga* species: 1, *arkansana*. 2, *inversa*. 3, *rugosa*. 4, *calceata*. 5, *knockii*. 6, *drakii*. $\times 1\frac{1}{2}$.



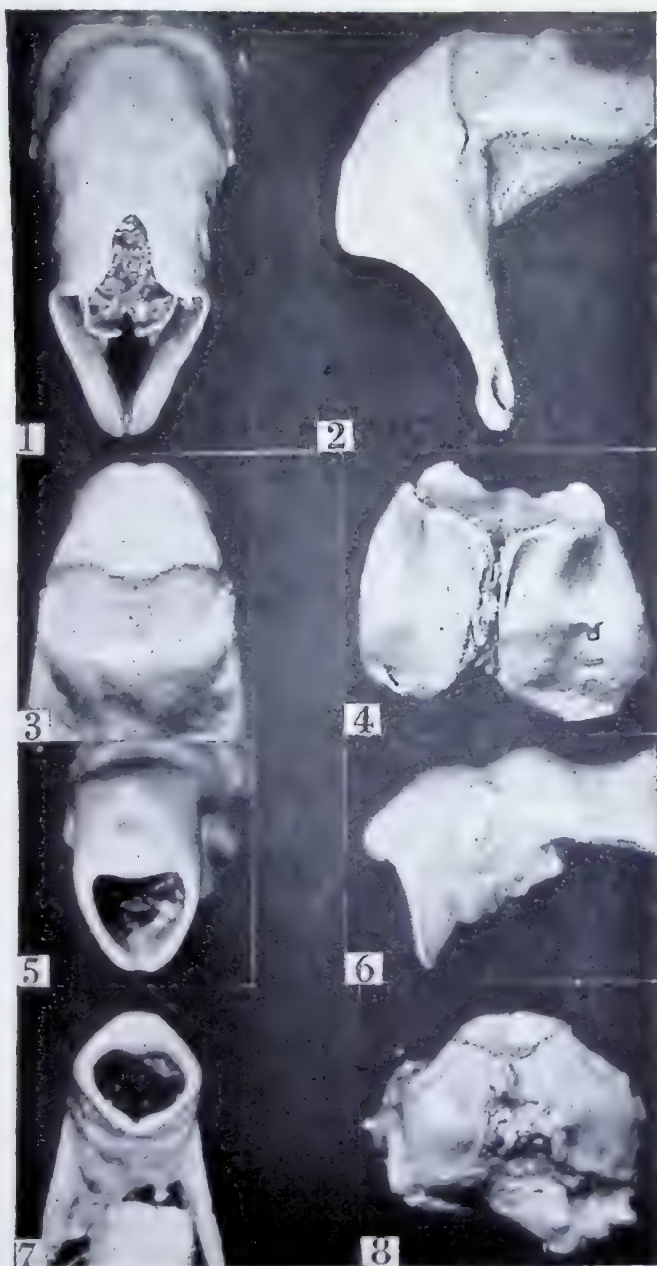
Venters of adult males of *Phyllophaga* species: 1, *luctuosa*. 2, *praetermissa*. 3, *ephilida*. 4, *fervida*. 5, *forsteri*. 6, *implicita*. 7, *profunda*. 8, *congrua*. 9, *micans*. 10, *anxia*. 11, *crassissima*. 12, *subpruinosa*. $\times 3\frac{1}{2}$.



Venters of adult males of *Phyllophaga* species: 1, *calceata*. 2, *bipartita*. 3, *futilis*. 4, *inversa*. 5, *knochii*. 6, *fraterna*. 7, *fusca*. 8, *parvidens*. 9, *forbesi*. 10, *vehemens*. 11, *cribrosa*. 12, *arkansana*. x $3\frac{1}{2}$.



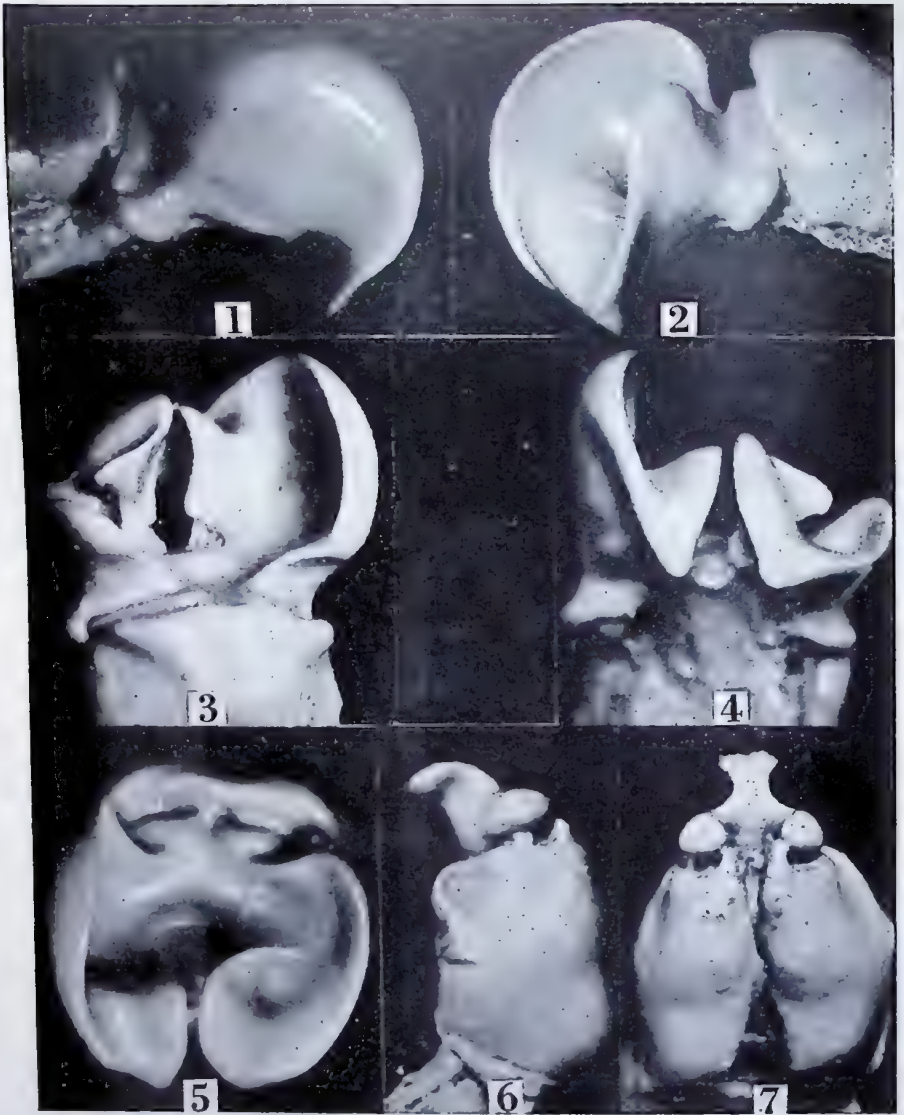
Genital aspects of *Phyllophaga* adult. *P. aequalis*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, ventral. $\times 20$.



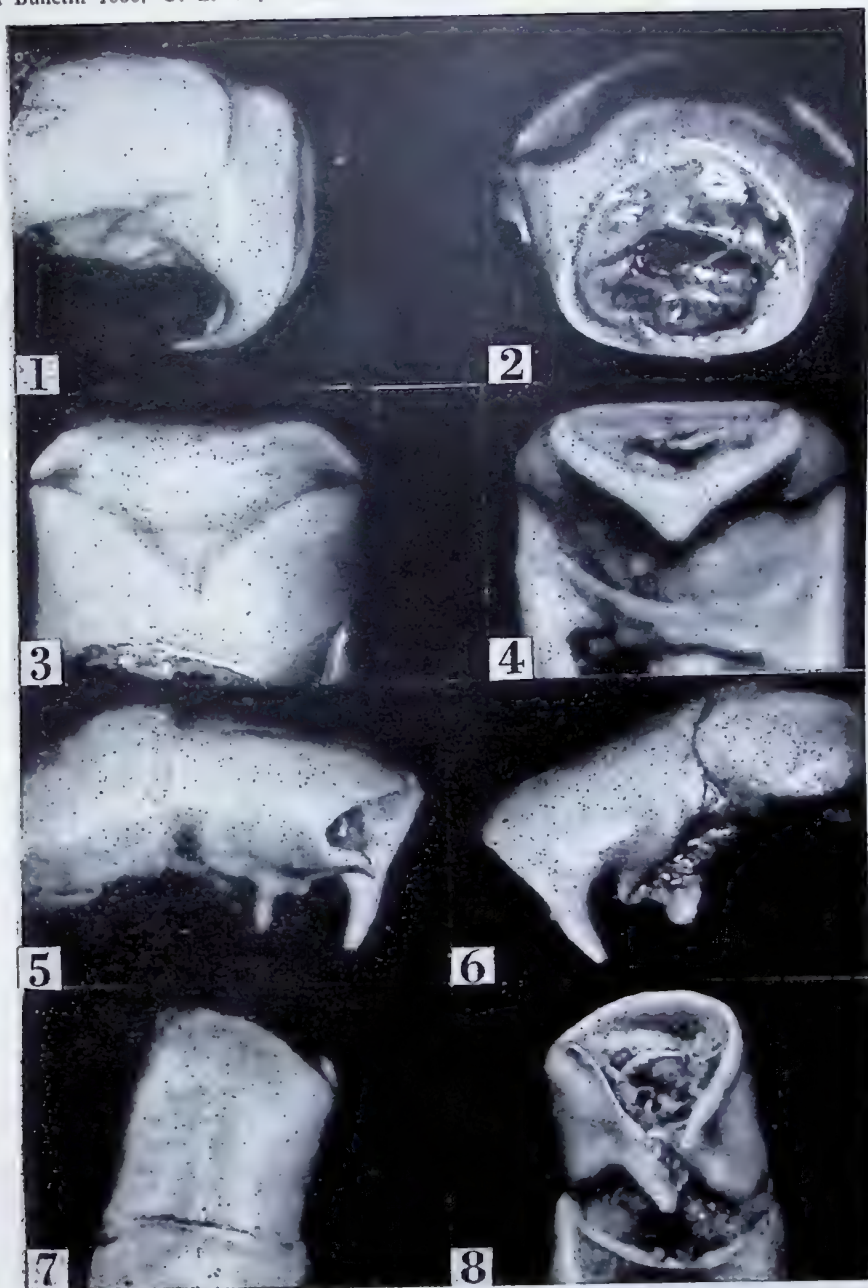
Genital aspects of *Phyllophaga* adults. *P. parvidens*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; female: 4, ventral. *P. lanceolata*, male: 5, Dorso-caudal; 6, right lateral; 7, caudo-ventral; female: 8, ventral. x 15.



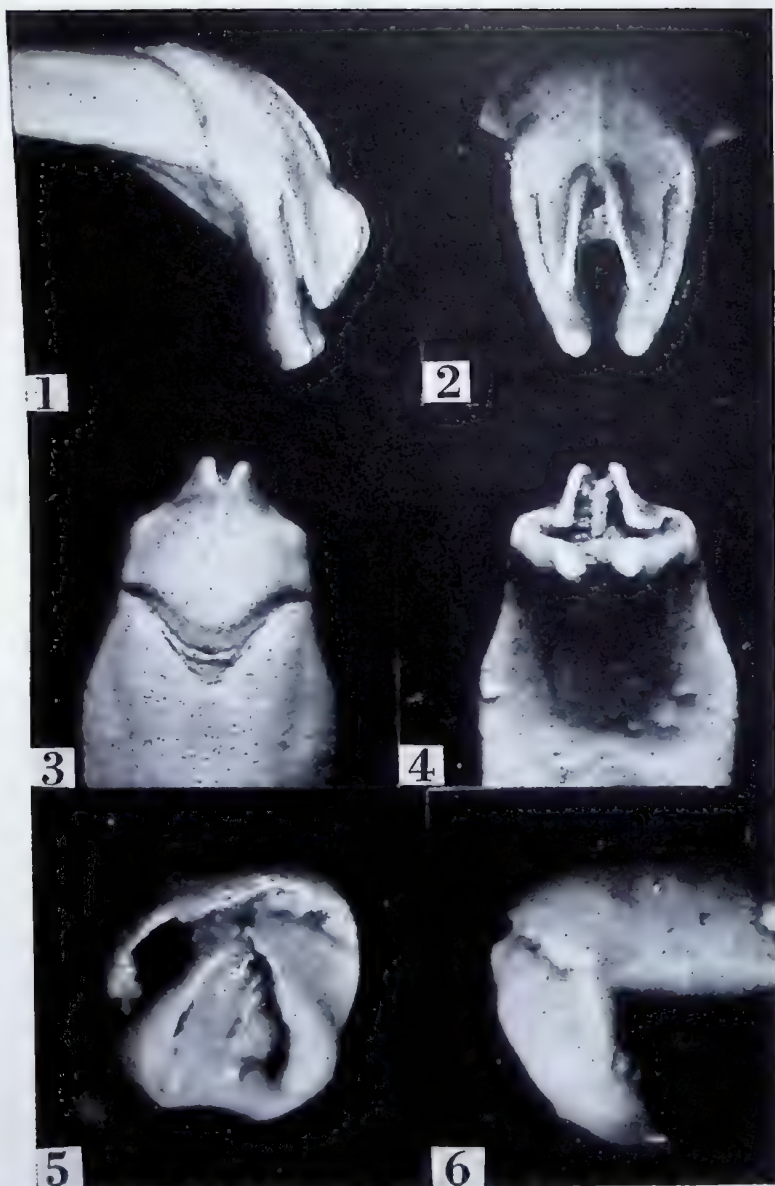
Genital aspects of *Phyllophaga* adults. *P. longispina*, male: 1, Left lateral, 2, right lateral, 3, dorsal; 4, ventral; 5, dorso-caudal; female: 6, ventral. *P. rubiginosa*, male: 7, Left lateral; 8, dorso-caudal; female: 9, ventral. x 15.



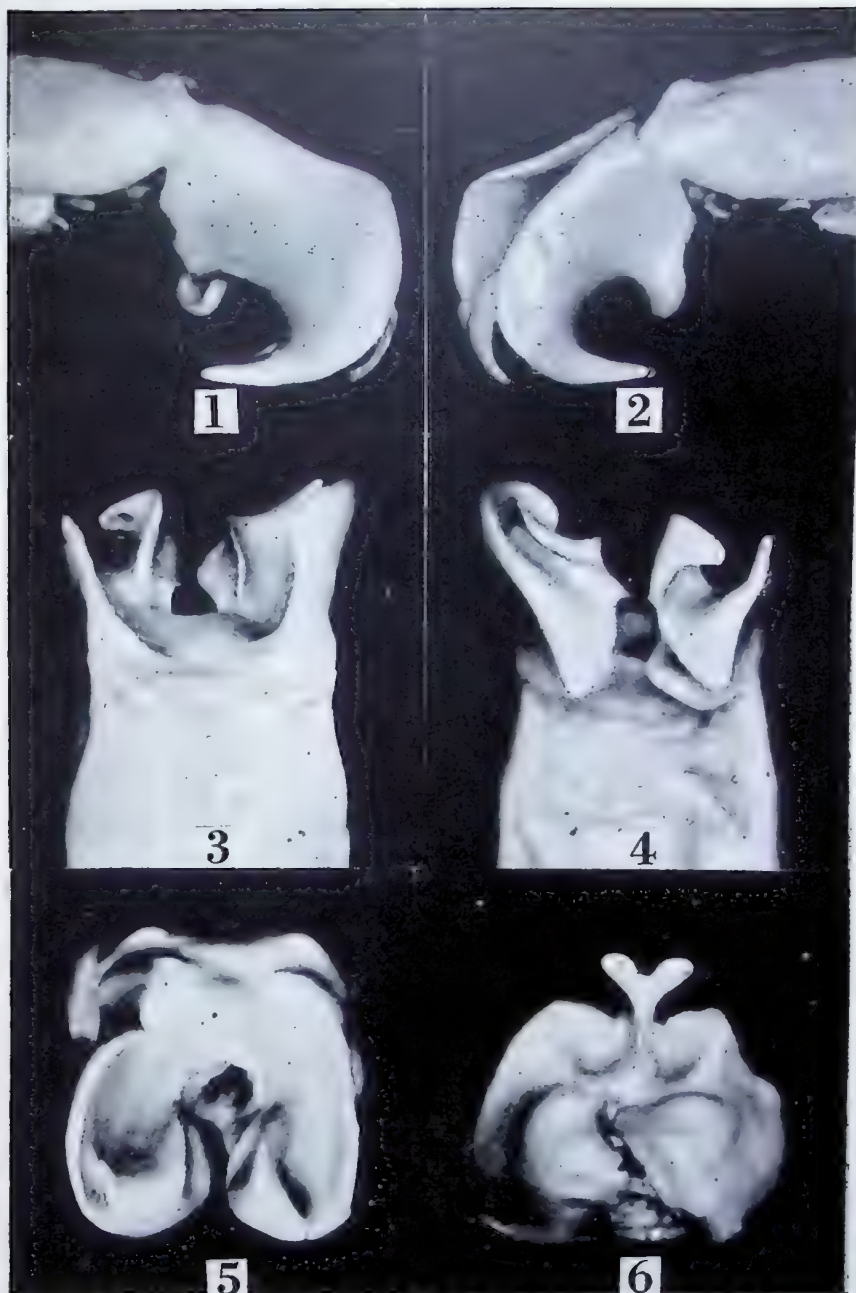
Genital aspects of *Phyllophaga* adults. *P. hirticula*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, ventral; 5, caudal; female: 6, left lateral; 7, ventral. x 15.



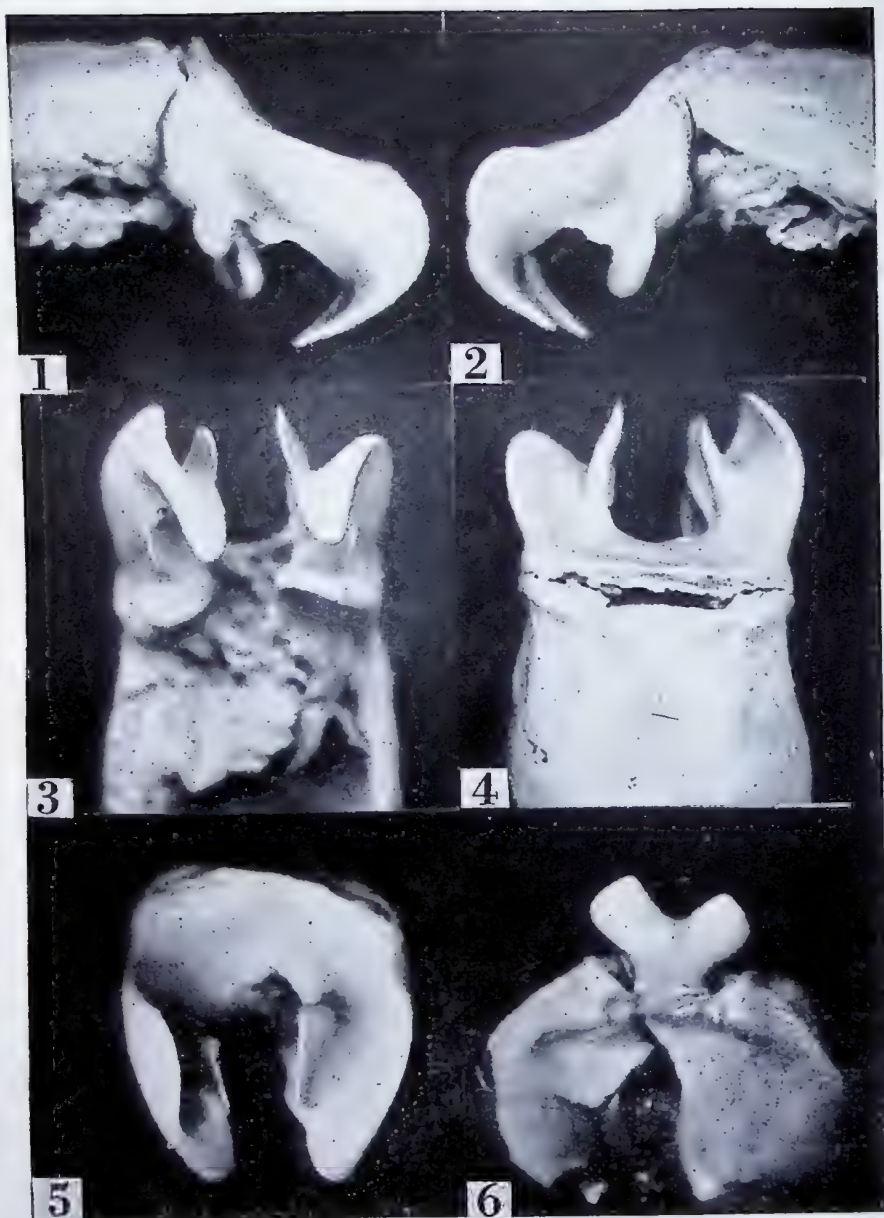
Genital aspects of *Phyllophaga* adults. *P. renodis*, male: 1, Left lateral; 2, dorso-caudal; 3, dorsal; 4, ventral. *P. stohleri*, male: 5, Left lateral; 6, right lateral; 7, dorsal; 8, ventral. x 20.



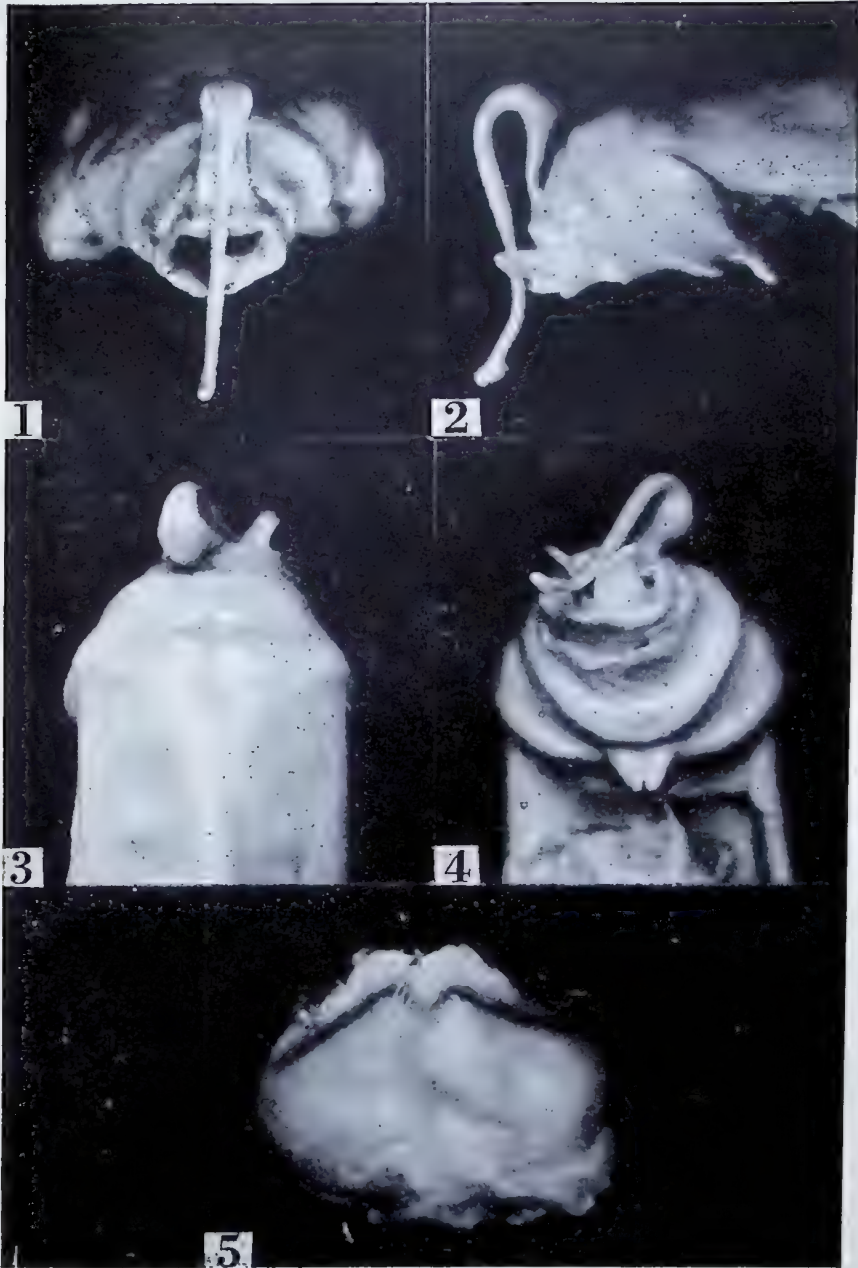
Genital aspects of *Phyllophaga* adults. *P. psiloptera*, male: 1, Left lateral; 2, dorso-caudal; 3, dorsal; 4, ventral. *P. rossi*, male: 5, Dorso-caudal; 6, right lateral. x 20.



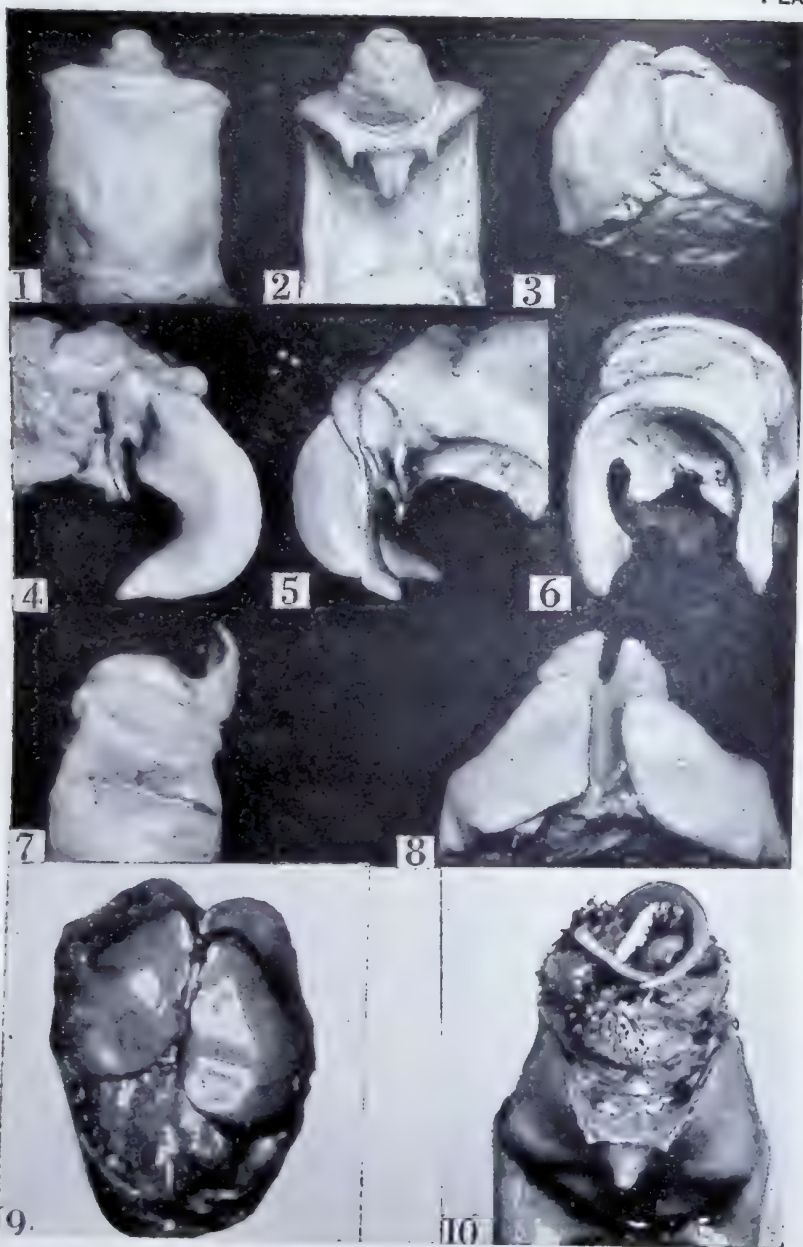
Genital aspects of *Phyllophaga* adults. *P. hirsuta*, male: 1. Left lateral; 2, right lateral; 3, dorsal; 4, ventral; 5, dorso-caudal; female: 6, ventral, x 20.



Genital aspects of *Phyllophaga* adults. *P. vilifrons*, male: 1, Left lateral; 2, right lateral; 3, ventral; 4, dorsal; 5, caudal; female: 6, ventral. x 20.



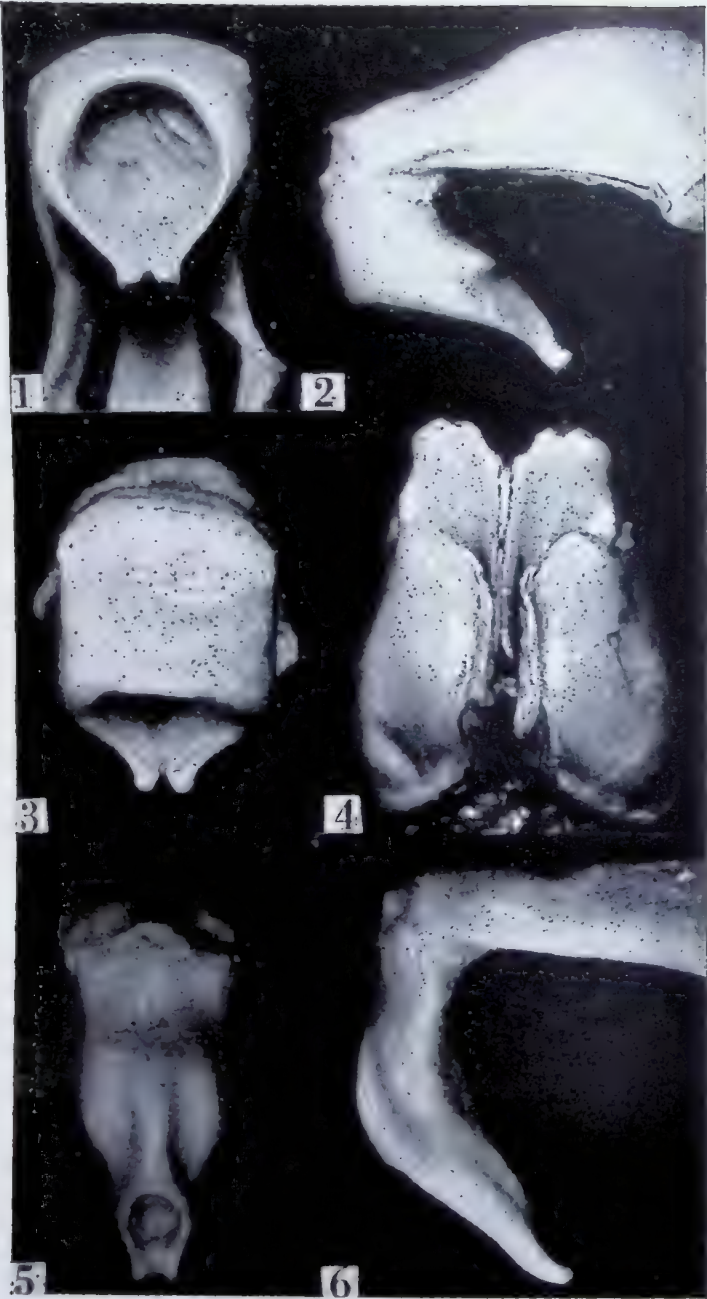
Genital aspects of *Phyllophaga* adults. *P. lenis*, male: 1, Caudal; 2, right lateral; 3, dorsal; 4, caudo-ventral; female: 5, ventral. x 20.



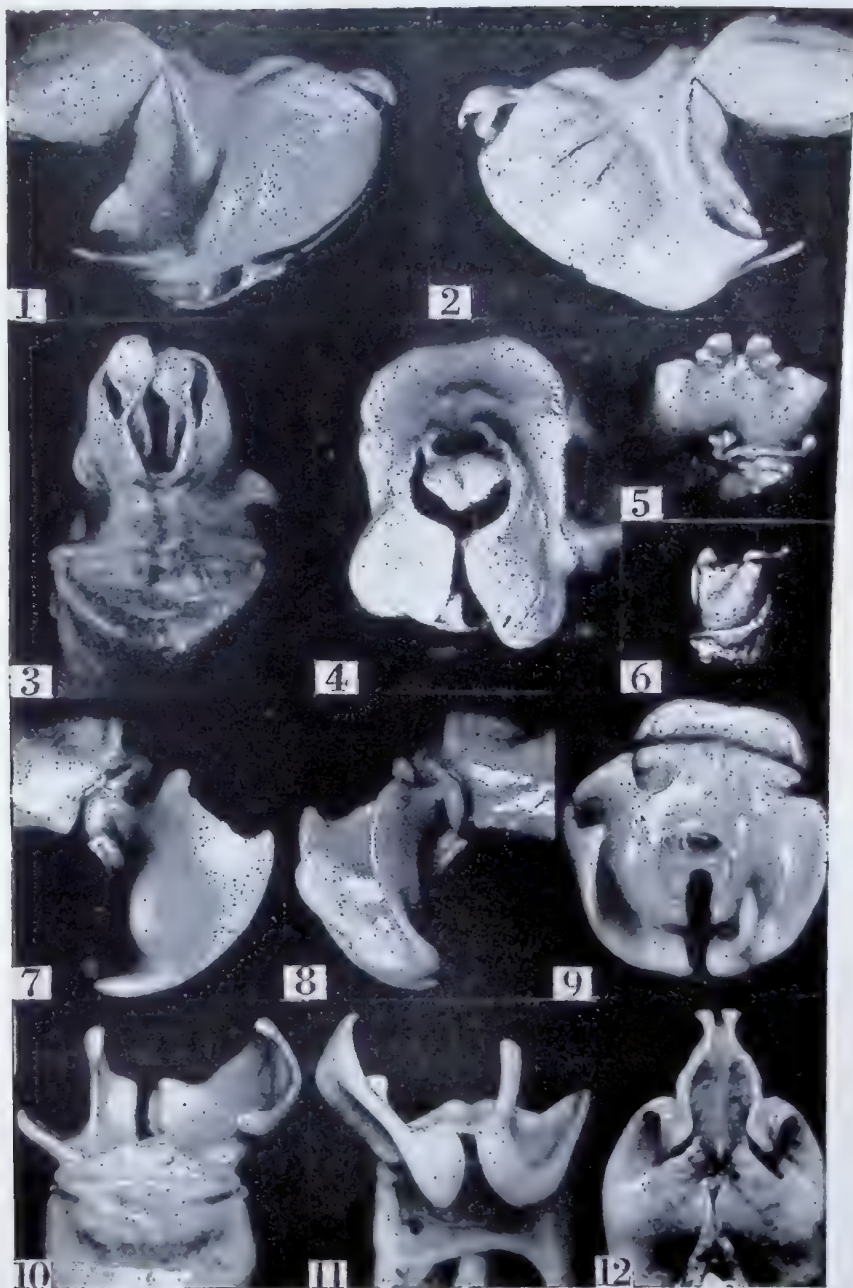
Genital aspects of *Phyllophaga* adults. *P. crinita*, male: 1, Dorsal; 2, caudo-ventral; female: 3, ventral. *P. impar*, male: 4, Left lateral; 5, right lateral; 6, dorso-caudal; 7, dorsal; female: 8, ventral. *P. vetula*, female: 9, Ventral; male: 10, caudo-ventral. x 15.



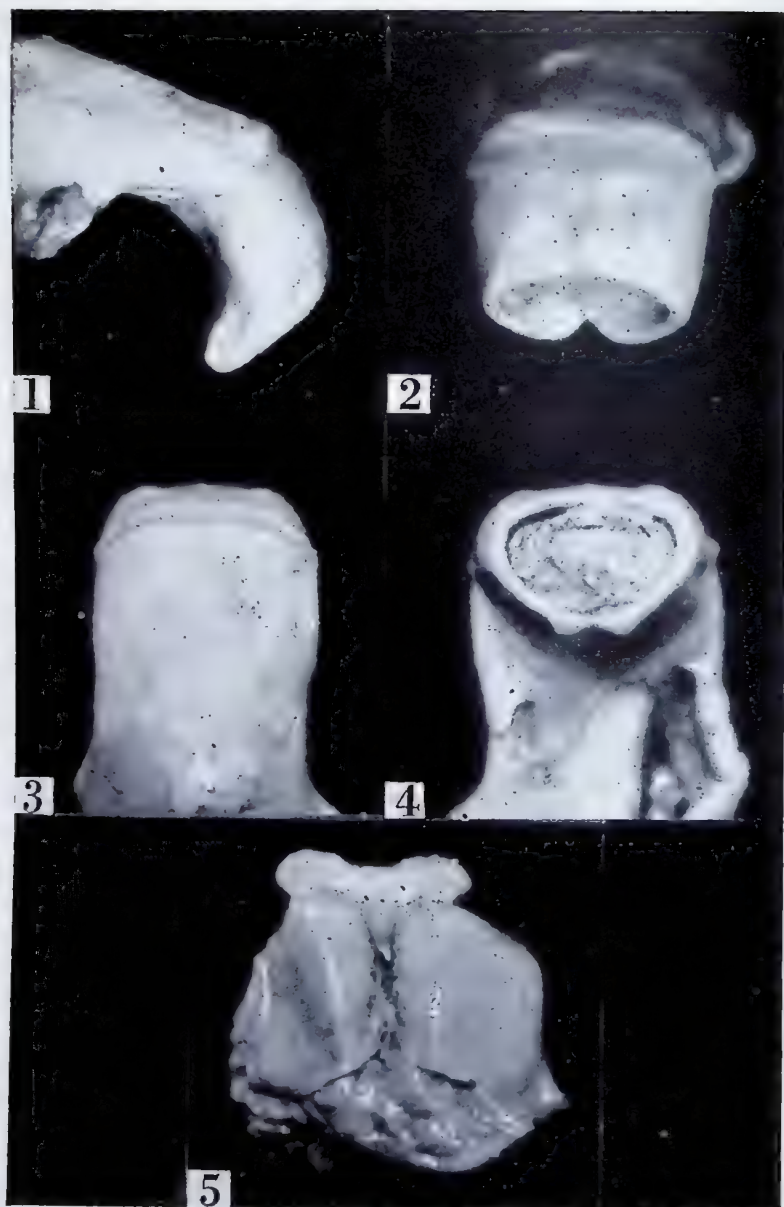
Genital aspects of *Phyllophaga* adults. *P. lobata*, male: 1, Left lateral; 2, dorso-caudal; 3, caudo-ventral; 4, dorsal; female: 5, ventral. *P. mariana*, male: 6, Dorso-caudal; 7, right lateral; 8, caudo-ventral; 9, dorsal; female: 10, left lateral; 11, ventral. $\times 13$.



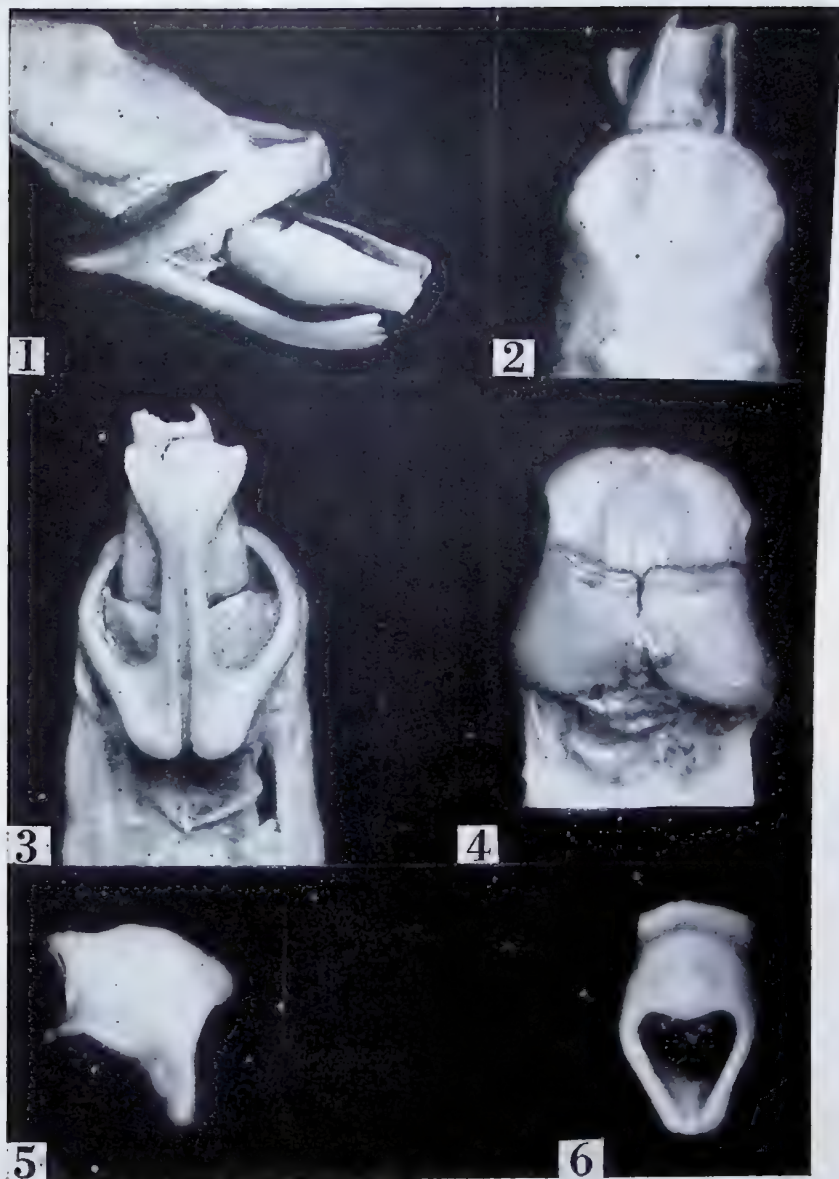
Genital aspects of *Phyllophaga* adults. *P. aemula*, male: 1, Caudo-ventral; 2, right lateral; 3, dorsal; female: 4, ventral. *P. elizoria*, male: 5, Dorso-caudal; 6, right lateral. $\times 15$.



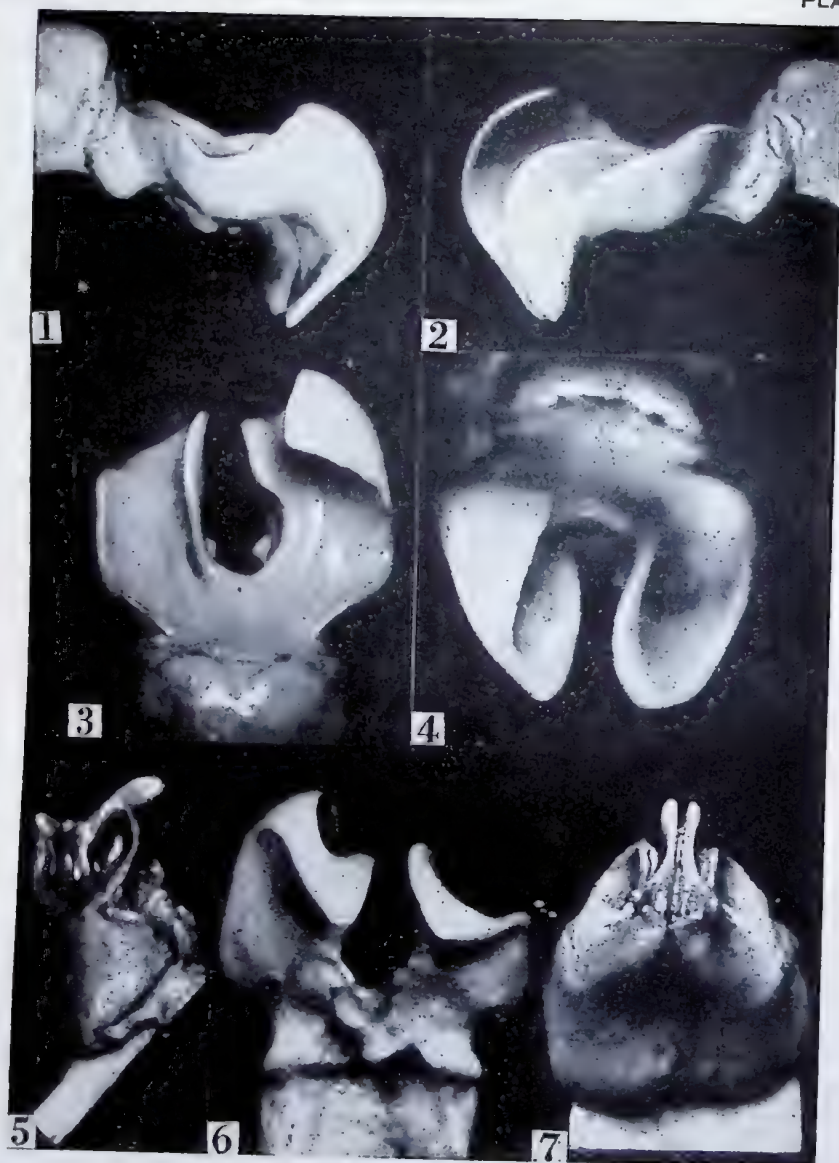
Genital aspects of *Phyllophaga* adults. *P. barda*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, caudal; female: 5, ventral; 6, right lateral. *P. ilicis*, male: 7, Left lateral; 8, right lateral; 9, caudal; 10, dorsal; 11, ventral; female: 12, ventral. x 10.



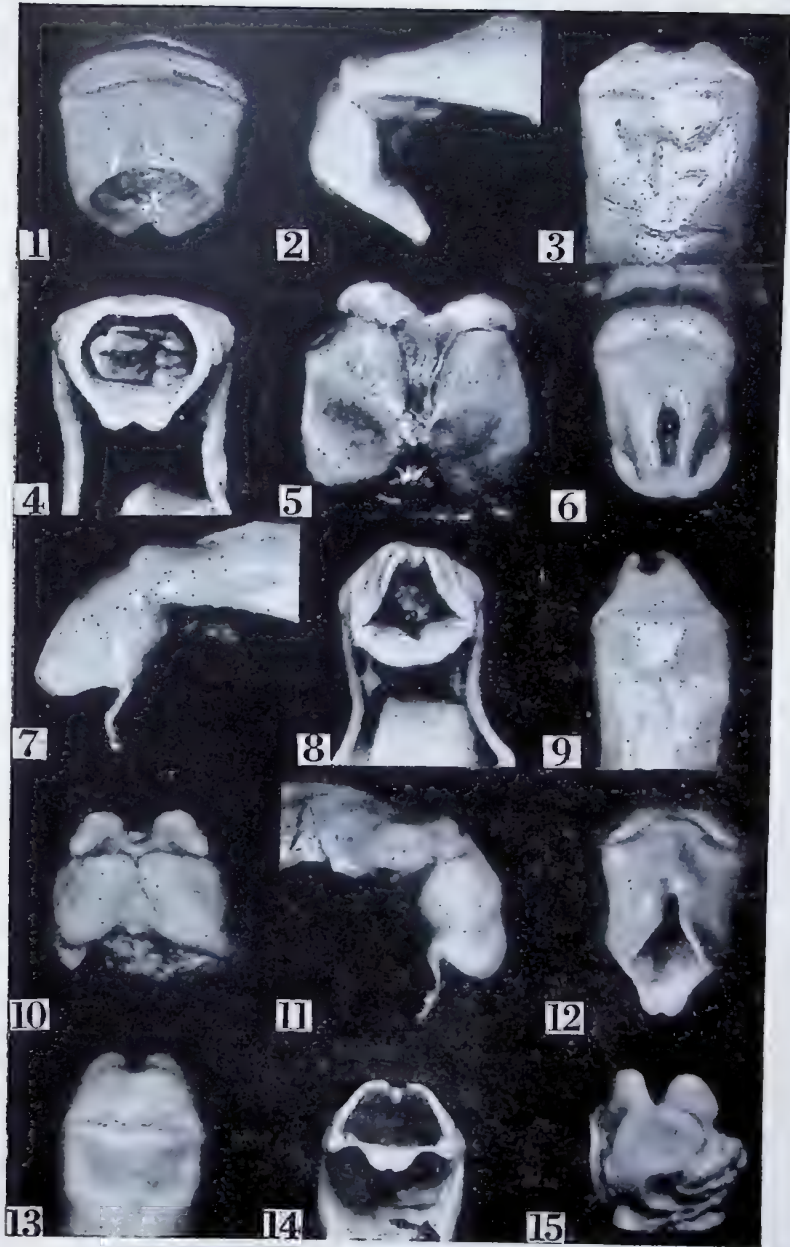
Genital aspects of *Phyllophaga* adults. *P. albina*, male; 1, Left lateral; 2, dorso-caudal; 3, dorsal; 4, caudo-ventral; female: 5, ventral. x 20.



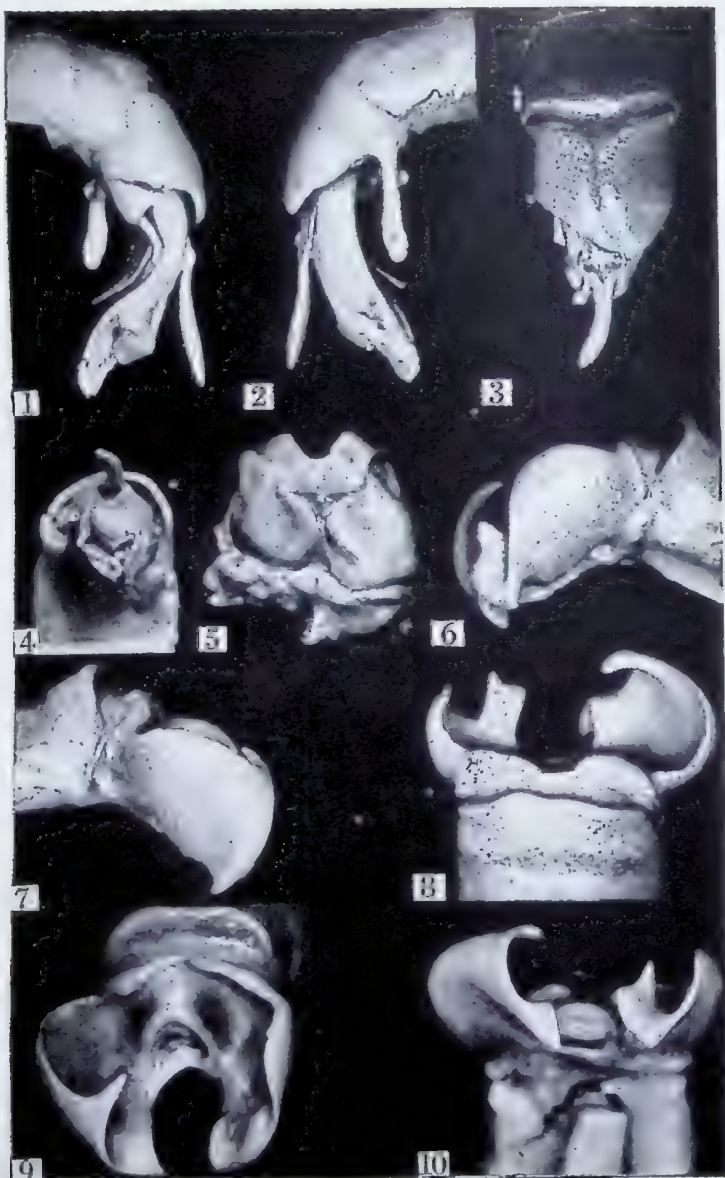
Genital aspects of *Phyllophaga* adults. *P. gravidula*, male: 1, Left lateral; 2, dorsal; 3, ventral; Female: 4, ventral. *P. squamipilosa*, male: 5, Left lateral; 6, dorso-caudal. x 20.



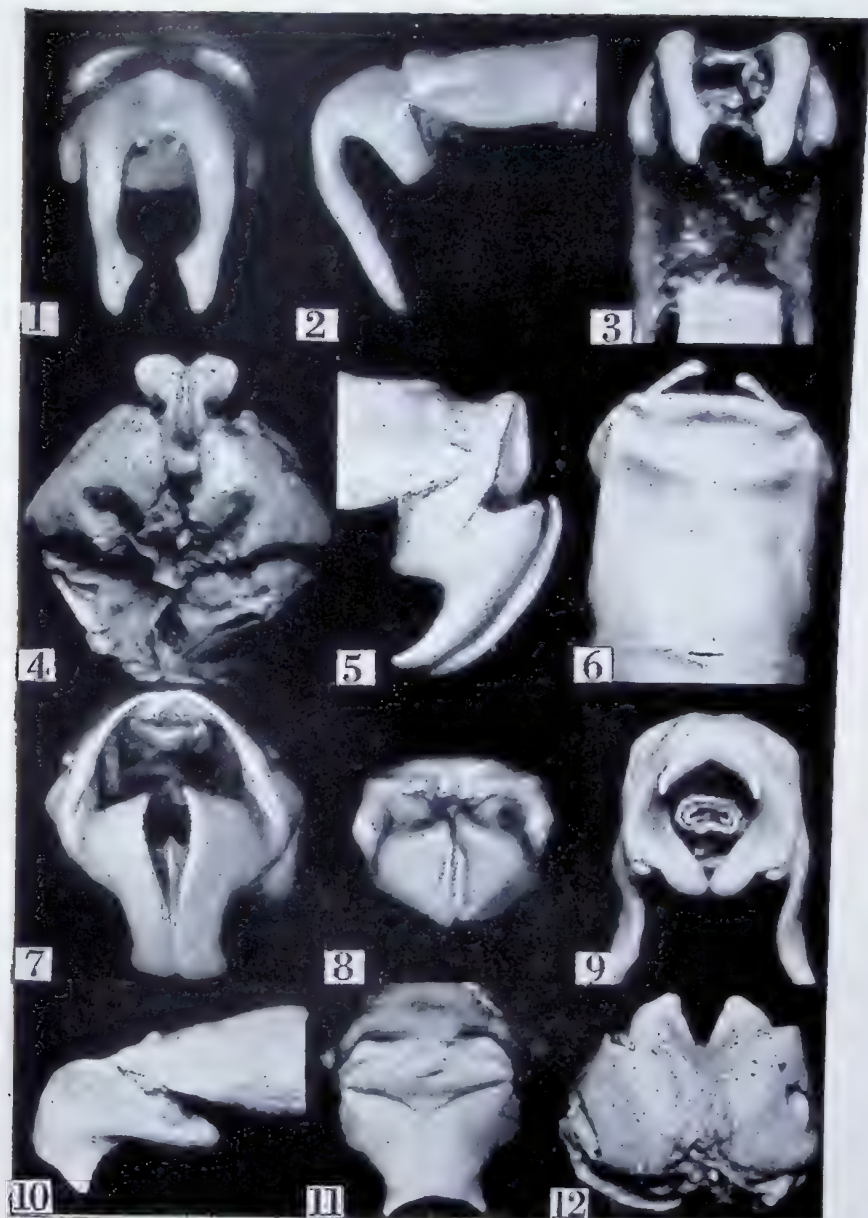
Genital aspects of *Phyllophaga* adults. *P. paternoï*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 6, ventral; female: 5, right lateral 7, ventral. x 15.



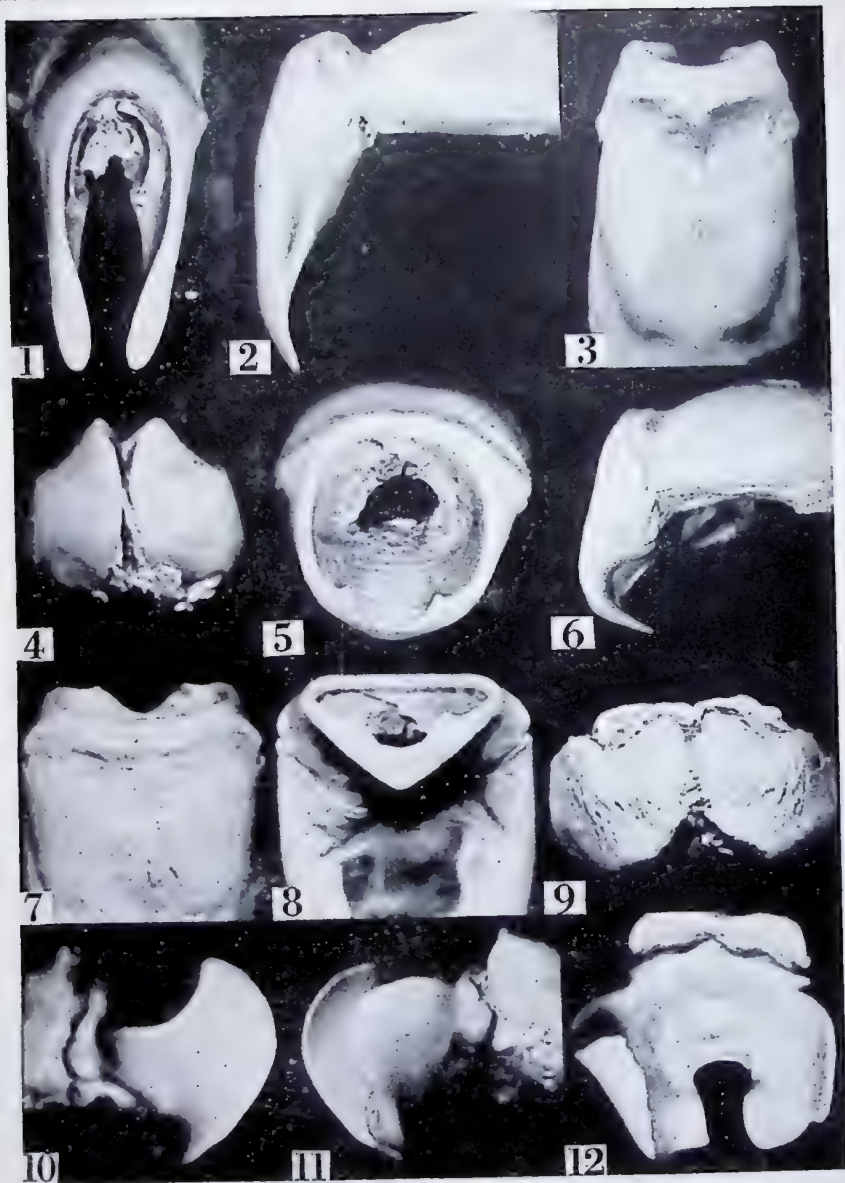
Genital aspects of *Phyllophaga* adults. *P. crenulata*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, caudo-ventral; female: 5, ventral. *P. arcta*, male: 6, Dorso-caudal; 7, right lateral; 8, caudo-ventral; 9, dorsal; female: 10, ventral. *P. opacita*, male: 11, Left lateral; 12, dorso-caudal; 13, dorsal; 14, caudo-ventral; female: 15, ventral. x 15.



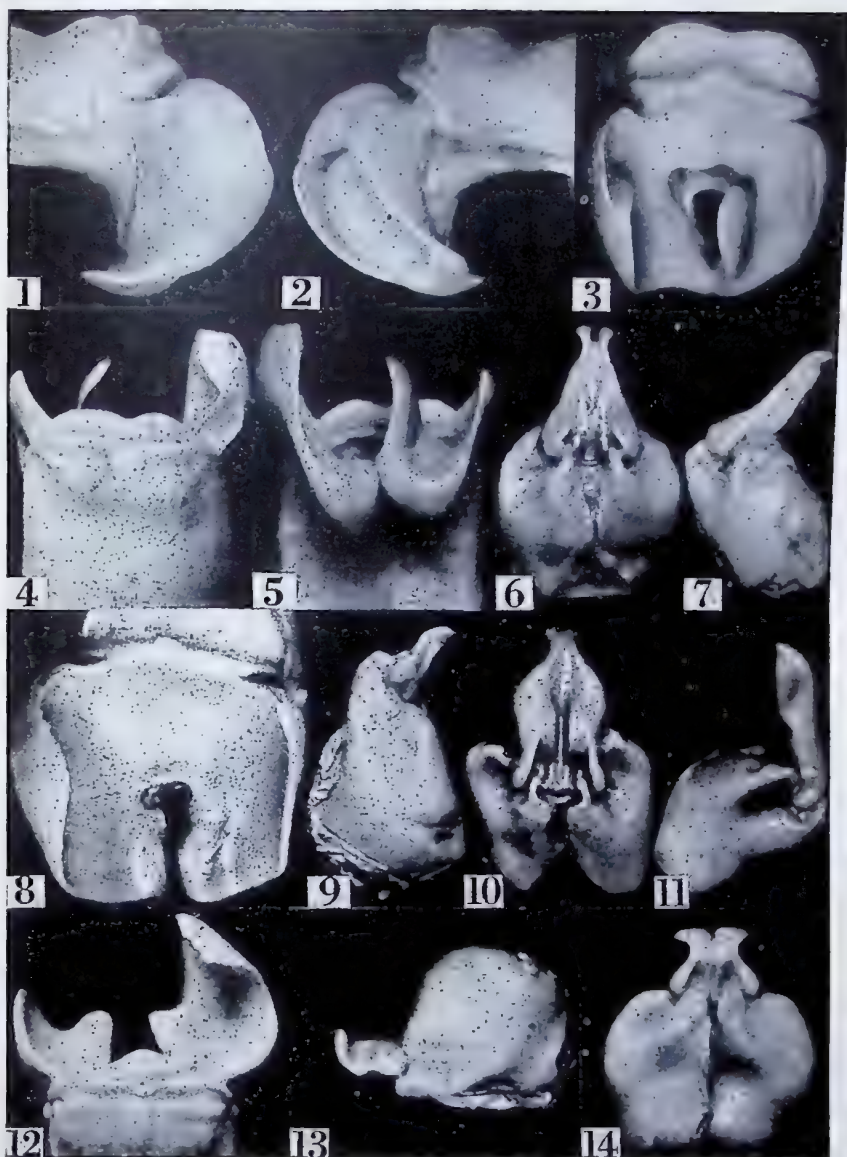
Genital aspects of *Phyllophaga* adults. *P. sociatus*, male: 1. Left lateral; 2, right lateral; 3, dorso-caudal; 4, ventral; female: 5, ventral. *P. pudorosa*, male: 6, Right lateral; 7, left lateral; 8, dorsal; 9, dorso-caudal; 10, ventral. $\times 13$.



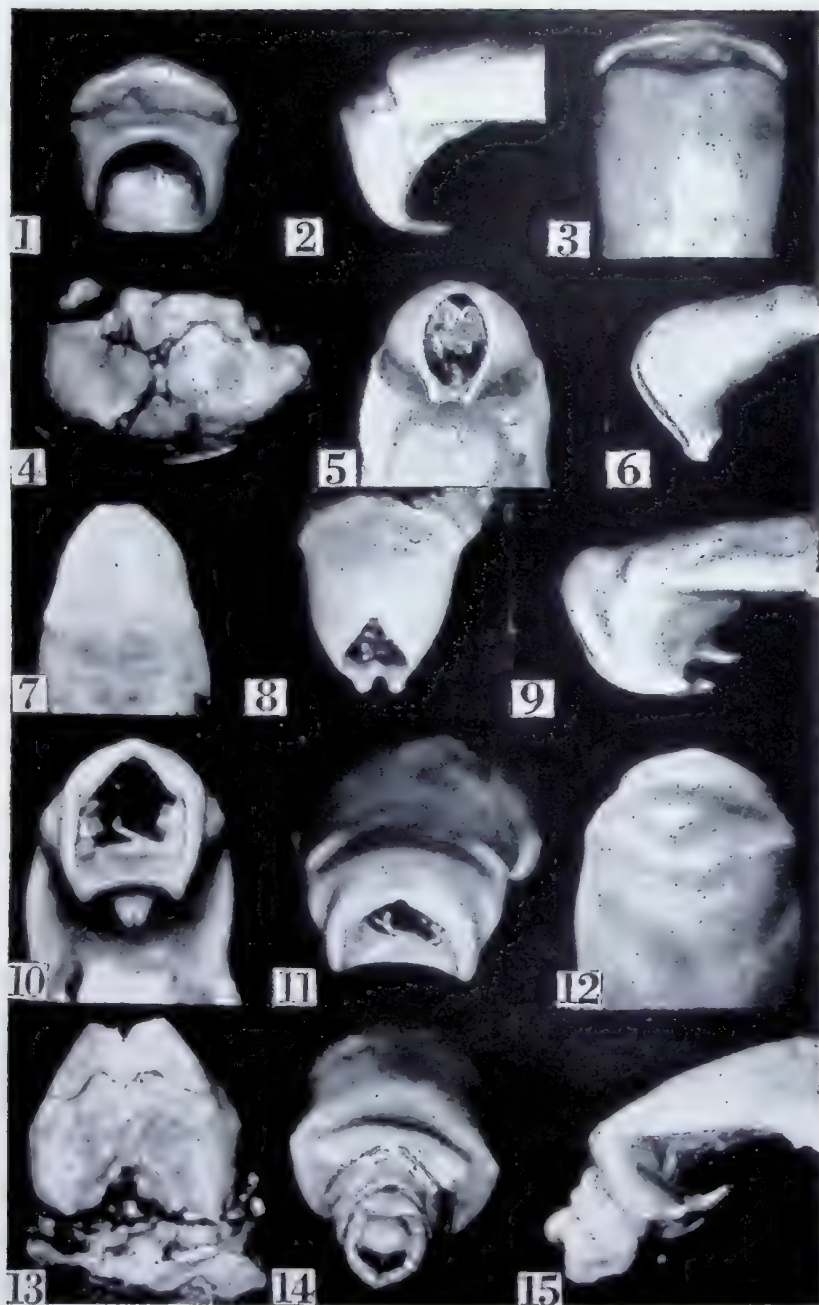
Genital aspects of *Phyllophaga* adults. *P. elongata*, male: 1, Dorso-caudal; 2, right lateral; 3, ventral; female: 4, ventral. *P. sacoma*, male: 5, Left lateral; 6, dorsal; 7, caudal; female: 8, ventral. *P. prununculina*, male: 9, Caudo-ventral; 10, right lateral; 11, dorso-caudal; female: 12, ventral. x 15.



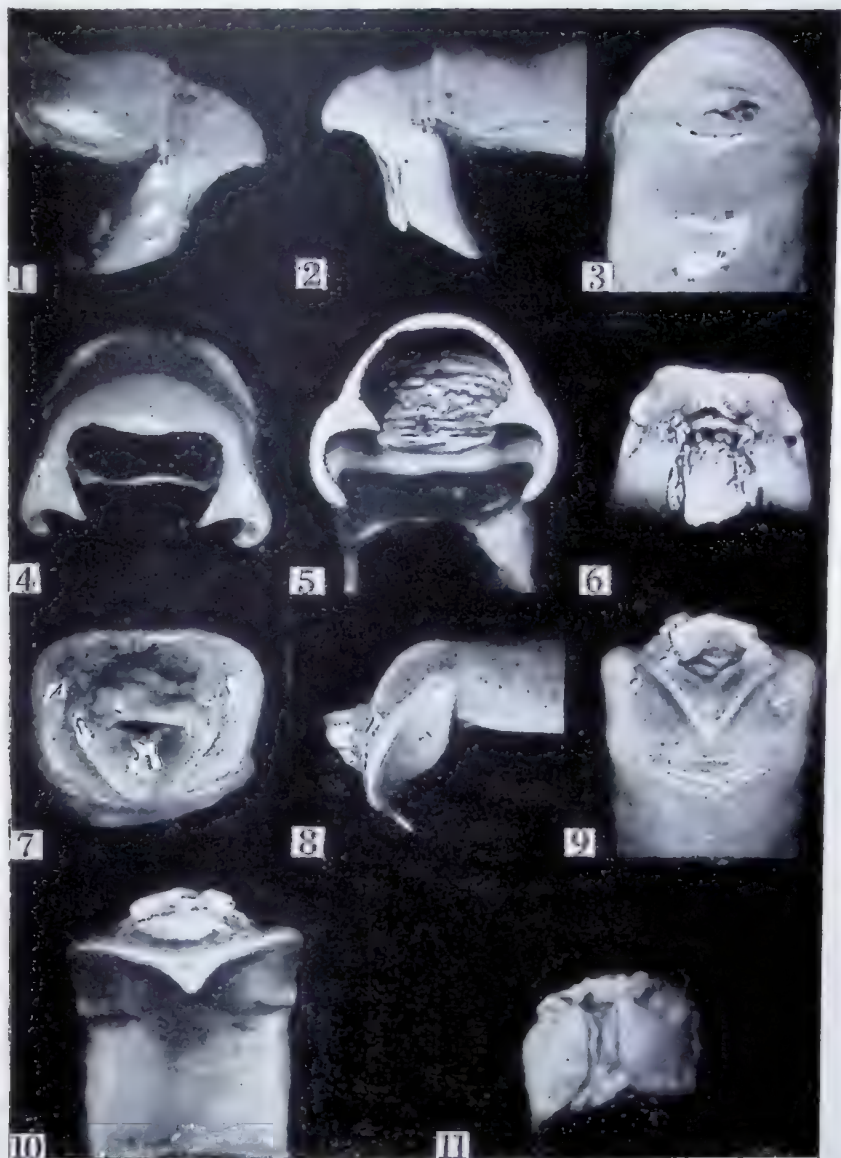
Genital aspects of *Phyllophaga* adults. *P. farcta*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; female: 4, ventral. *P. cribrata*, male: 5, Dorso-caudal; 6, right lateral; 7, dorsal; 8, ventral; female: 9, ventral. *P. delata*, male: 10, Left lateral; 11, right lateral; 12, dorso-caudal. x 10.



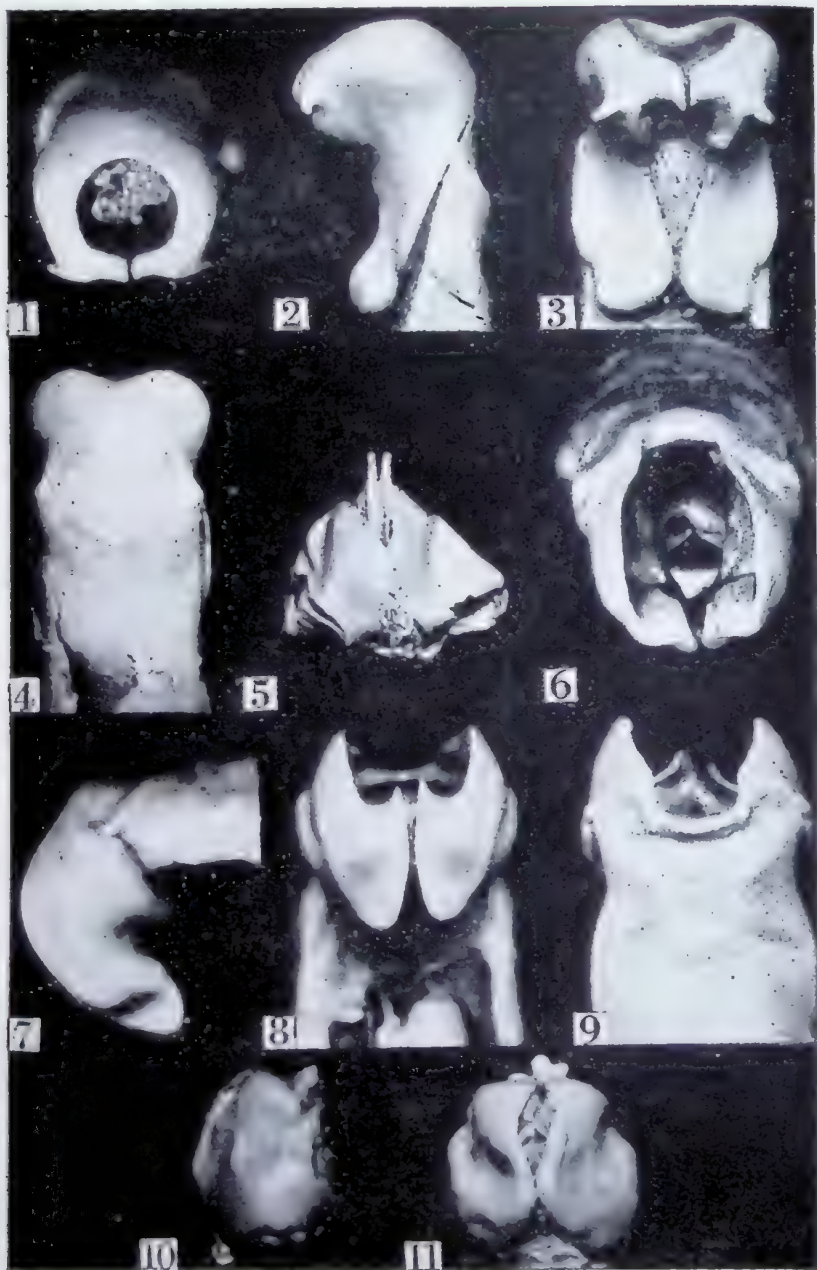
Genital aspects of *Phyllophaga* adults. *P. subtonsa*, male: 1, Left lateral; 2, right lateral; 3, dorso-caudal; 4, dorsal; 5, ventral; female: 6, ventral; 7, right lateral. *P. fraterna* var. *mississippiensis*, male: 8, Dorso-caudal; female: 9, right lateral. *P. pearliae*, female: 10, Ventral; 11, left lateral. *P. delata*, male: 12, Dorsal; female: 13, right lateral; 14, ventral. x 10.



Genital aspects of *Phyllophaga* adults. *P. rubricosa*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; female: 4, ventral. *P. iroides*, male: 5, Caudo-ventral; 6, right lateral; 7, dorsal; 8, dorso-caudal. *P. tristis*, male: 9, Right lateral; 10, caudo ventral; 11, dorso-caudal; 12, dorsal; female: 13, ventral. *P. crinita*, male: 14, Dorso-caudal; 15, right lateral. x 15.



Genital aspects of *Phyllophaga* adults. *P. submucida*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, caudo-ventral; female: 6, ventral. *P. dentex*, male: 7, Caudal; 8, right lateral; 9, dorsal; 10, ventral, female: 11, ventral. x 13.



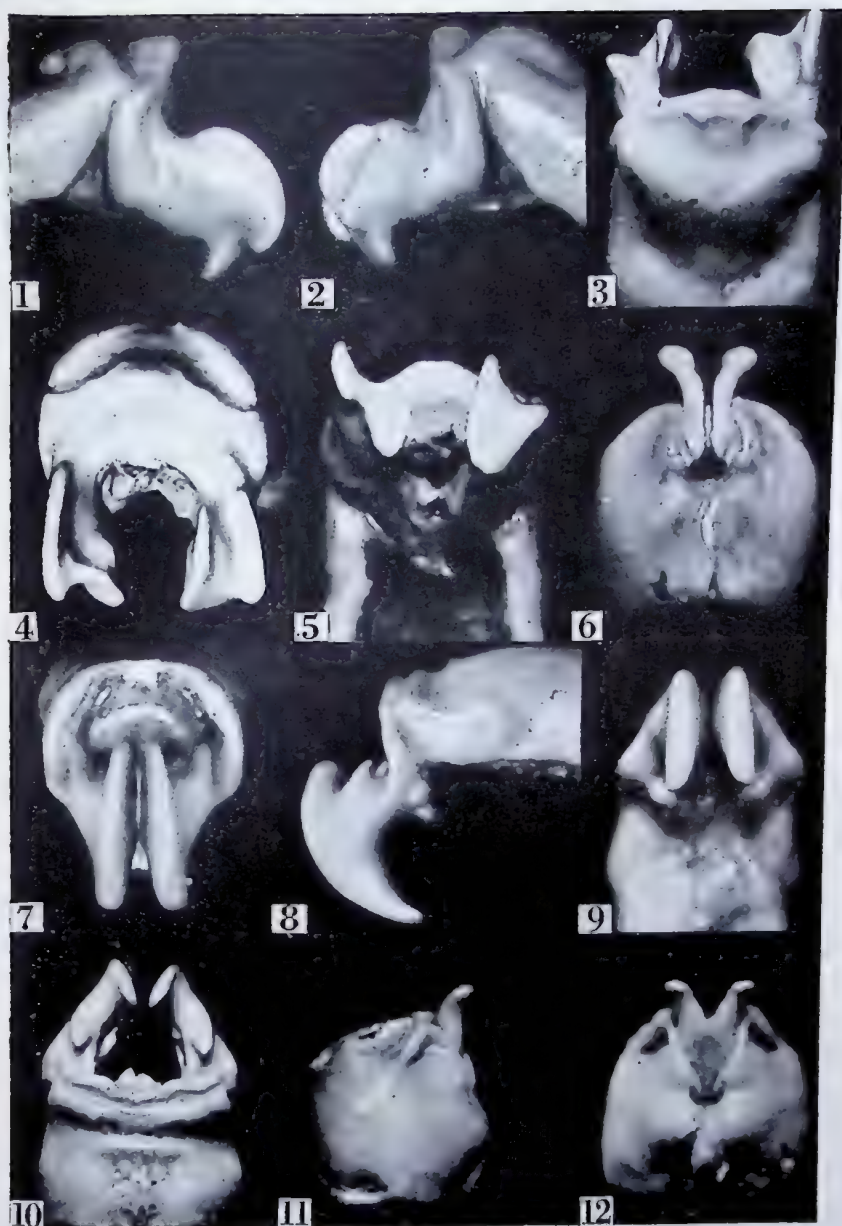
Genital aspects of *Phyllophaga* adults. *P. latifrons*, male: 1, Dorso-caudal; 2, right lateral; 3, ventral; 4, dorsal; female: 5, ventral. *P. subpruinosa*, male: 6, Dorso-caudal; 7, right lateral; 8, ventral; 9, dorsal; female: 10, right lateral; 11, ventral. x 15.



Genital aspects of *Phyllophaga* adults. *P. davisi*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, caudo-ventral; female: 5, ventral. *P. pusillidens*, male: 6, Dorso-caudal; 7, right lateral; 8, ventral; 9, dorsal. *P. quercus*, male: 10, Dorso-caudal; 11, right lateral; female: 12, ventral. x 15.



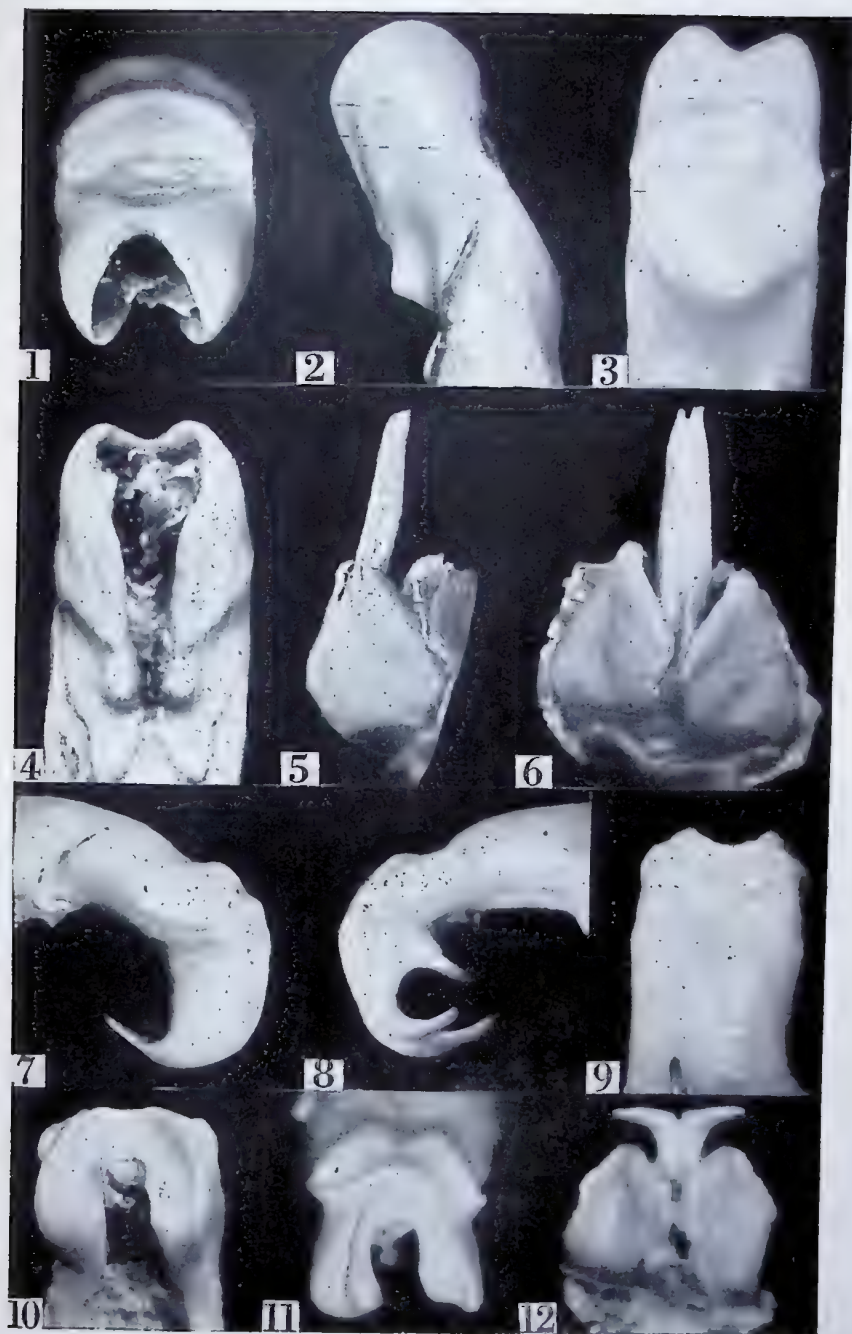
Genital aspects of *Phyllophaga* adults. *P. micans*, male: 1, Ventral; 2, right lateral; 3, dorso-caudal; 4, dorsal; female: 5, ventral. *P. micans* var. *cupuliformis*, male: 6, Dorso-caudal; 7, dorsal; 8, right lateral; 9, caudo-ventral; female: 10, right lateral; 11, ventral *P. marginalis*, female: 12, Left lateral. x 13.



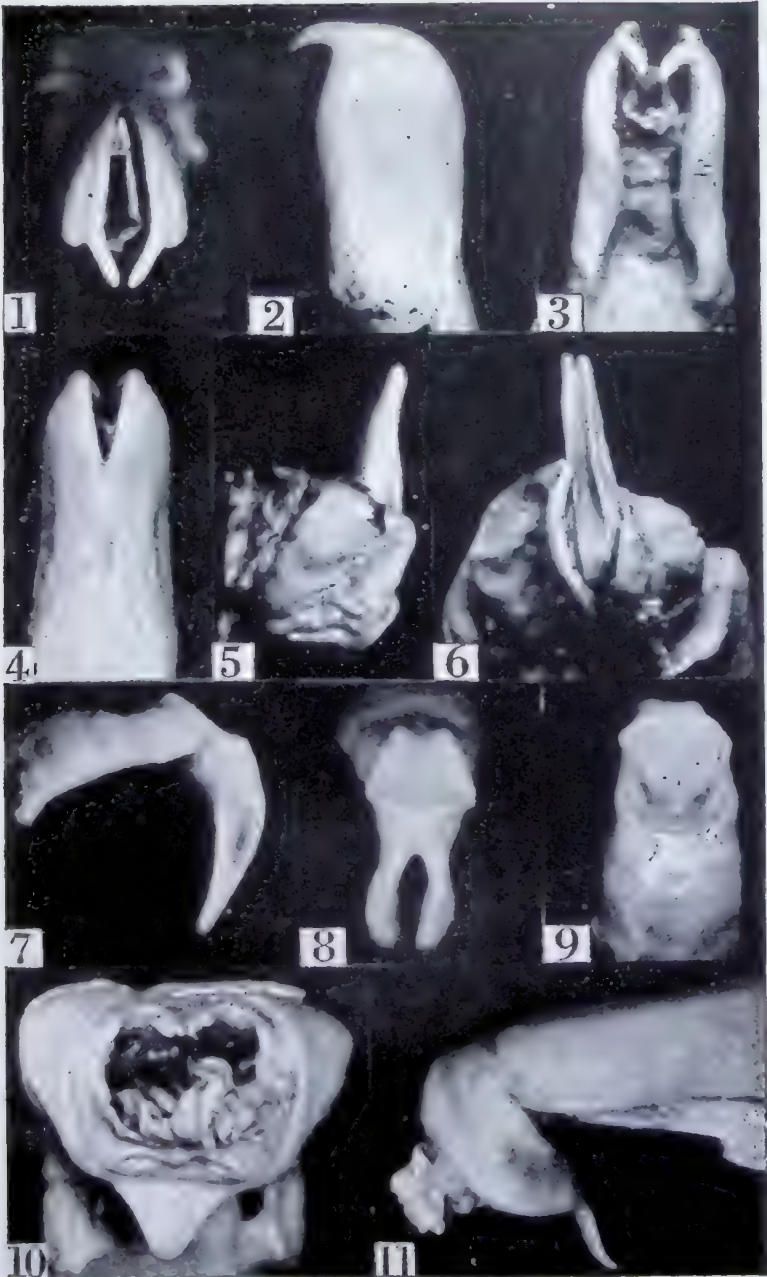
Genital aspects of *Phyllophaga* adults. *P. prunina*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. crassissima*, male: 7, Dorso-caudal; 8, right lateral; 9, ventral; 10, dorsal; female: 11, left lateral; 12, ventral. x 13



Genital aspects of *Phyllophaga* adults. *P. tusa*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, ventral. *P. debilis*, male: 5, Left lateral; 6, dorso-caudal; 7, dorsal; 8, ventral; female: 9, ventral. *P. juvenilis*, male: 10, Left lateral. x 20.



Genital aspects of *Phyllophaga* adults. *P. clypeata*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, ventral; female: 5, right lateral; 6, ventral. *P. diffinis*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, caudo-ventral, 11, dorso-caudal; female: 12, ventral. x 15.



Genital aspects of *Phyllophaga* adults. *P. dispar*, male: 1, Dorso-caudal; 2, right lateral, 3, ventral; 4, dorsal; female: 5, left lateral; 6, ventral. *P. clemens*, male: 7, Left lateral; 8, dorso-caudal; 9, dorsal. *P. ravida guatemalica*, male: 10, Caudo-ventral; 11, right lateral. x 20.



Genital aspects of *Phyllophaga* adults. *P. lota*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, caudo-ventral; female: 5, left lateral; 6, ventral. *P. inflexa* male; 7, Dorso-caudal; 8, right lateral. x 20.



Genital aspects of *Phyllophaga* adults. *P. taxodii*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, caudo-ventral; female: 5, ventral. *P. heterodoxa*, male: 6, Ventral; 7, dorso-caudal. x 20.



Genital aspects of *Phyllophaga* adults. *P. affabilis*, male: 1, Ventral; 2, right lateral; 3, dorso-caudal; 4, dorsal; female: 5, ventral. x 20.



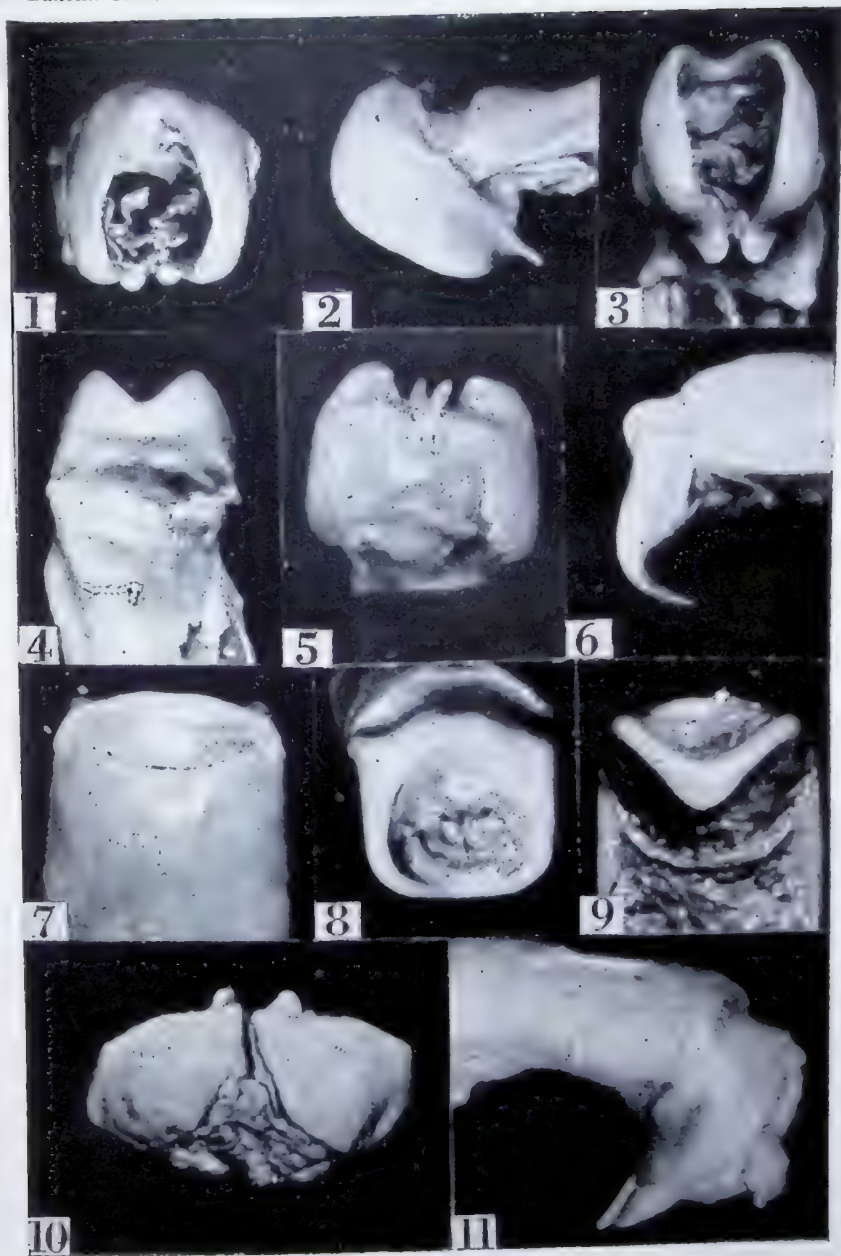
Genital aspects of *Phyllophaga* adults. *P. youngi*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. nitida*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; 11, ventral; female: 12, ventral. $\times 13$.



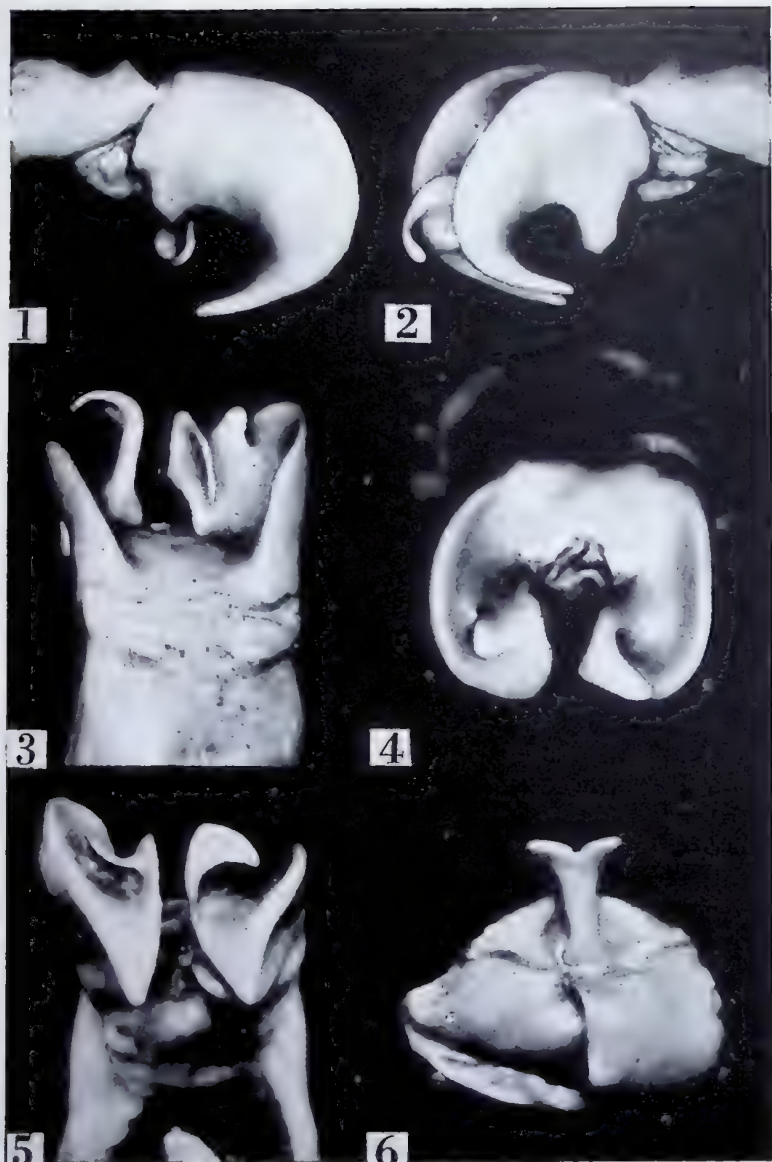
Genital aspects of *Phyllophaga* adults. *P. fucata*, male: 1, Dorsal; 2, dorso-caudal; 3, right lateral. *P. inepta*, male: 4, Dorsal; 5, dorso-caudal; 6, right lateral; 7, caudo-ventral; female: 8, left lateral; 9, ventral. x 20.



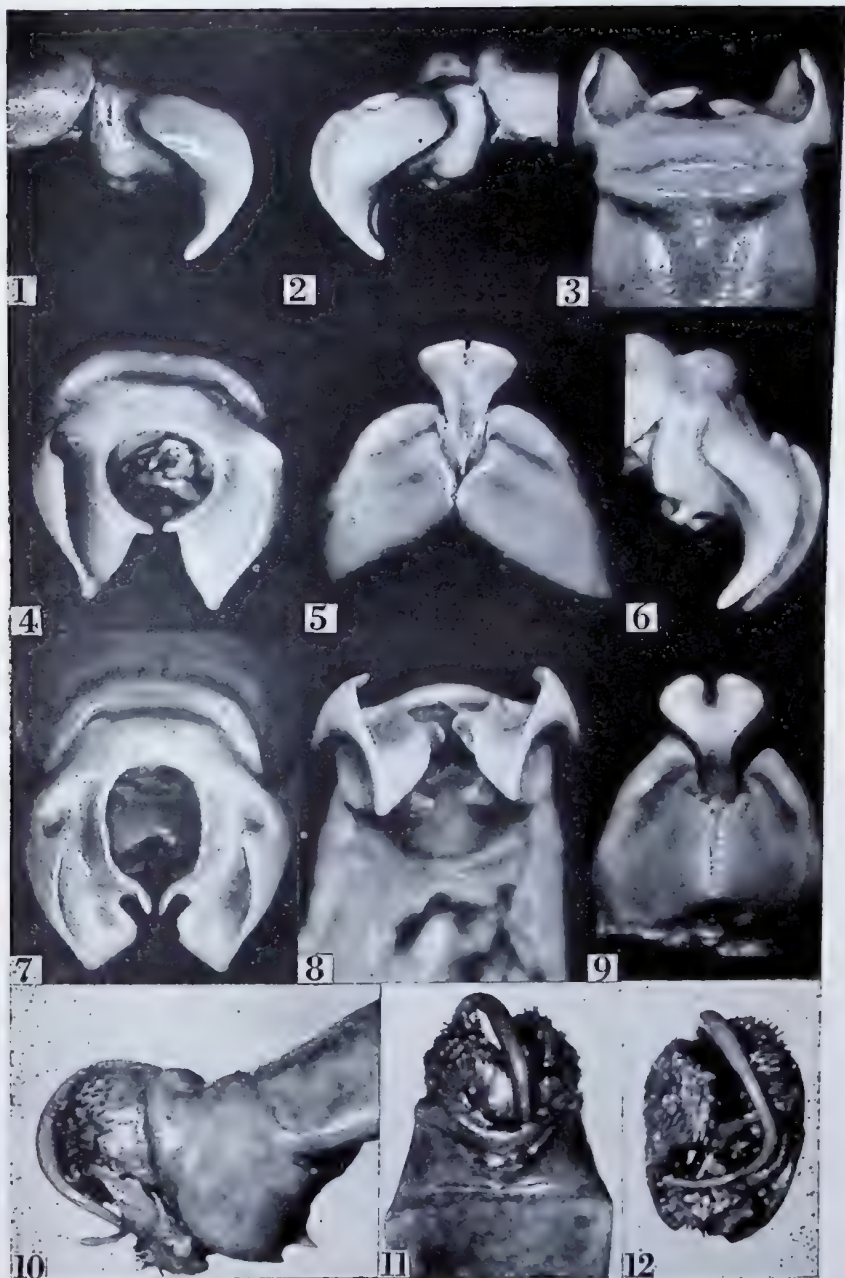
Genital aspects of *Phyllophaga* adults. *P. implicita*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. soror*, male: 7, Left lateral; 8, right lateral; 9, dorso-caudal; 10, ventral; 11, dorsal; female; 12, ventral. x 13.



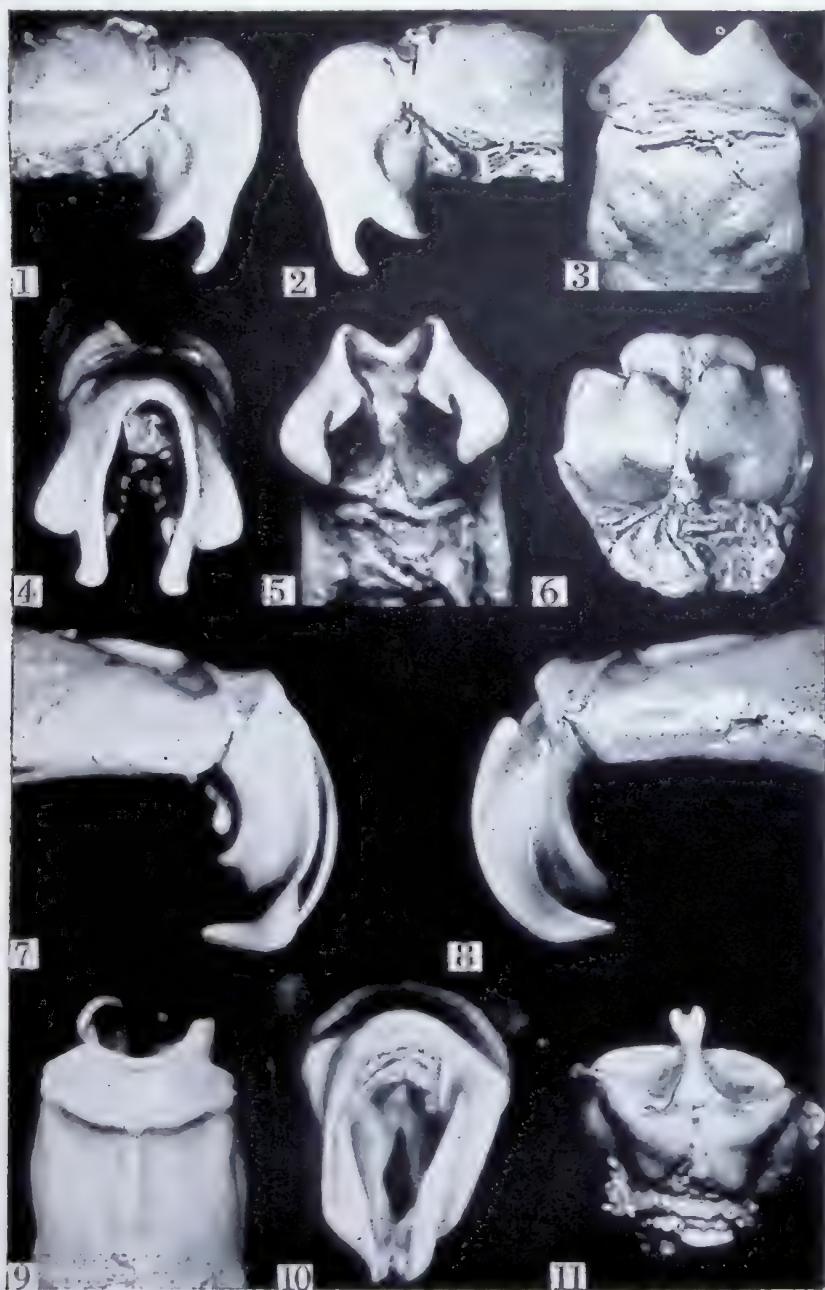
Genital aspects of *Phyllophaga* adults. *P. longitarsa*, male: 1, Caudal; 2, right lateral; 3, caudo-ventral; 4, dorsal; female: 5, ventral. *P. epigoea*, male: 6, right lateral; 7, dorsal; 8, dorso-caudal; 9, ventral; female: 10, ventral. *P. heterodoxa*, male: 11, Left lateral. x 20.



Genital aspects of *Phyllophaga* adults. *P. balia*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female 6, ventral. x 20.



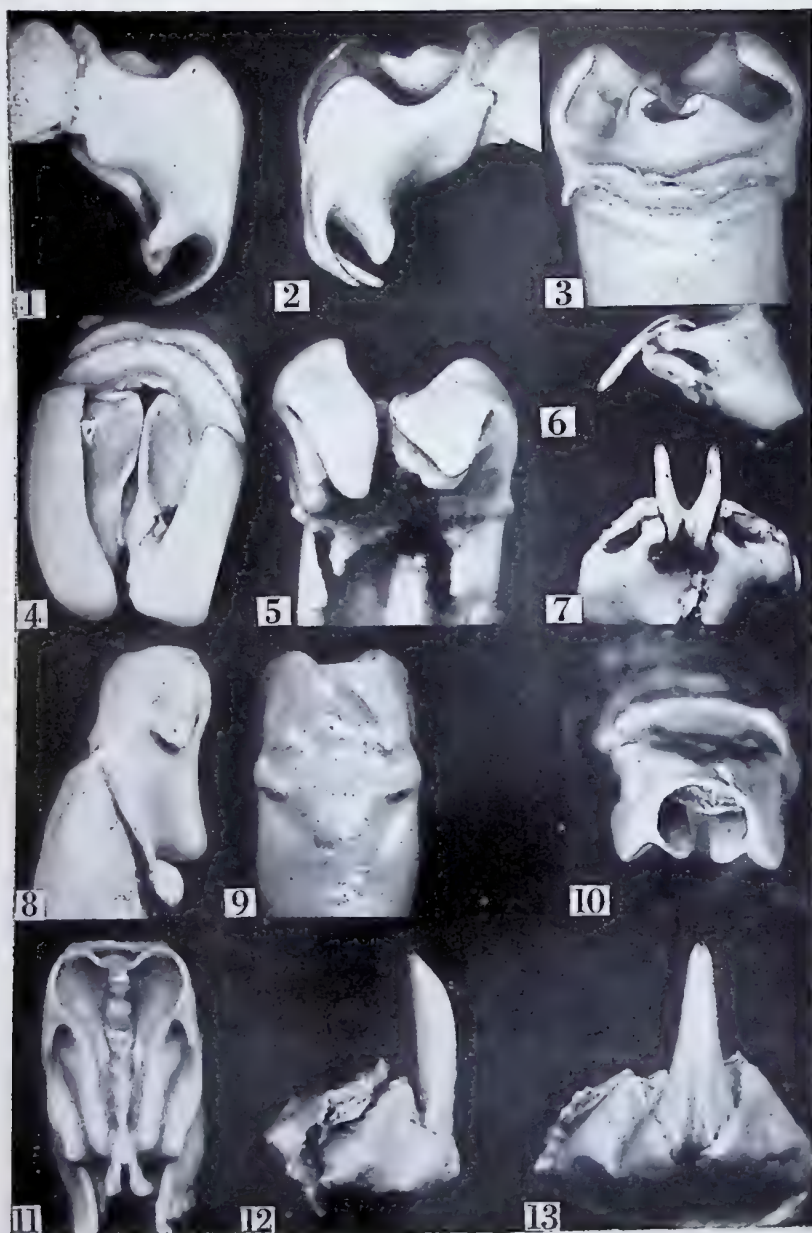
Genital aspects of *Phyllophaga* adults. *P. errans*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, ventral. *P. Sequoiana*, male: 6, Left lateral; 7, dorso-caudal; 8, ventral; female: 9, ventral. *P. vetula*, male: 10, Right lateral; 11, dorsal; 12, caudo-ventral. x 13.



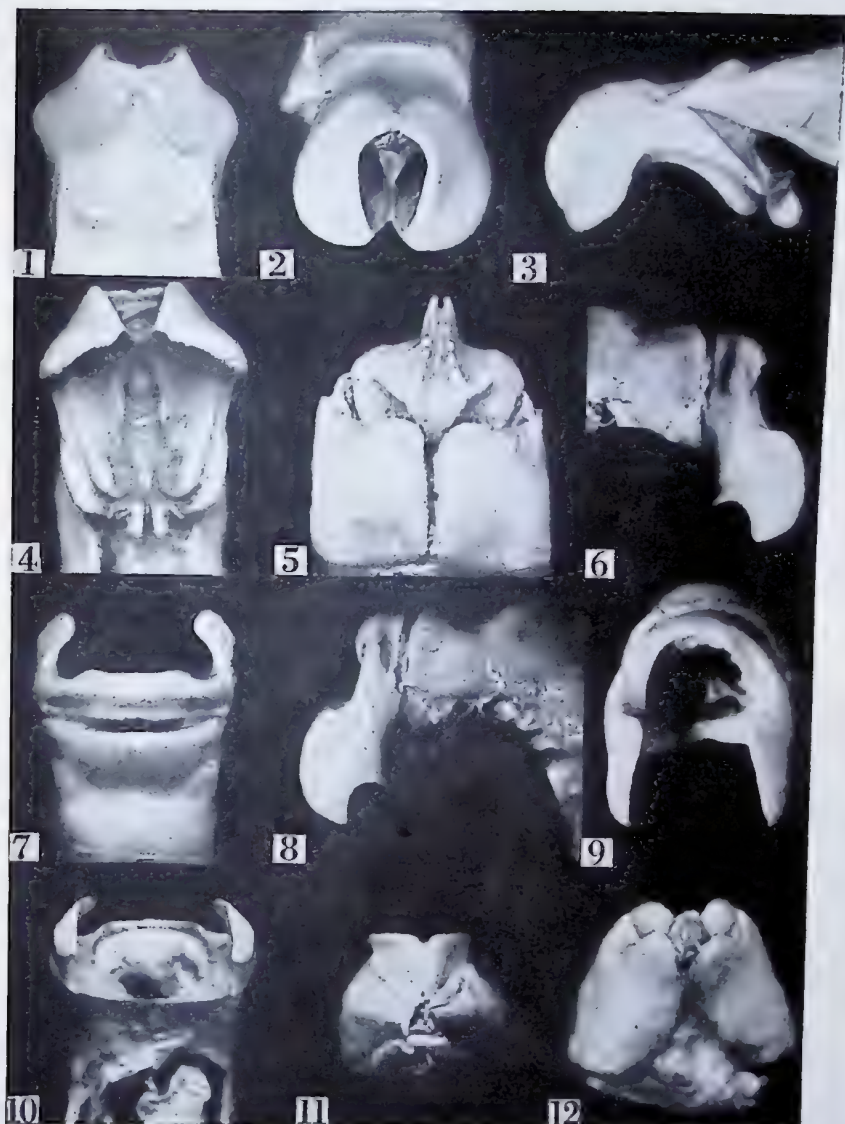
Genital aspects of *Phyllophaga* adults. *P. torta*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. arkansana*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; female: 11, ventral. x 13.



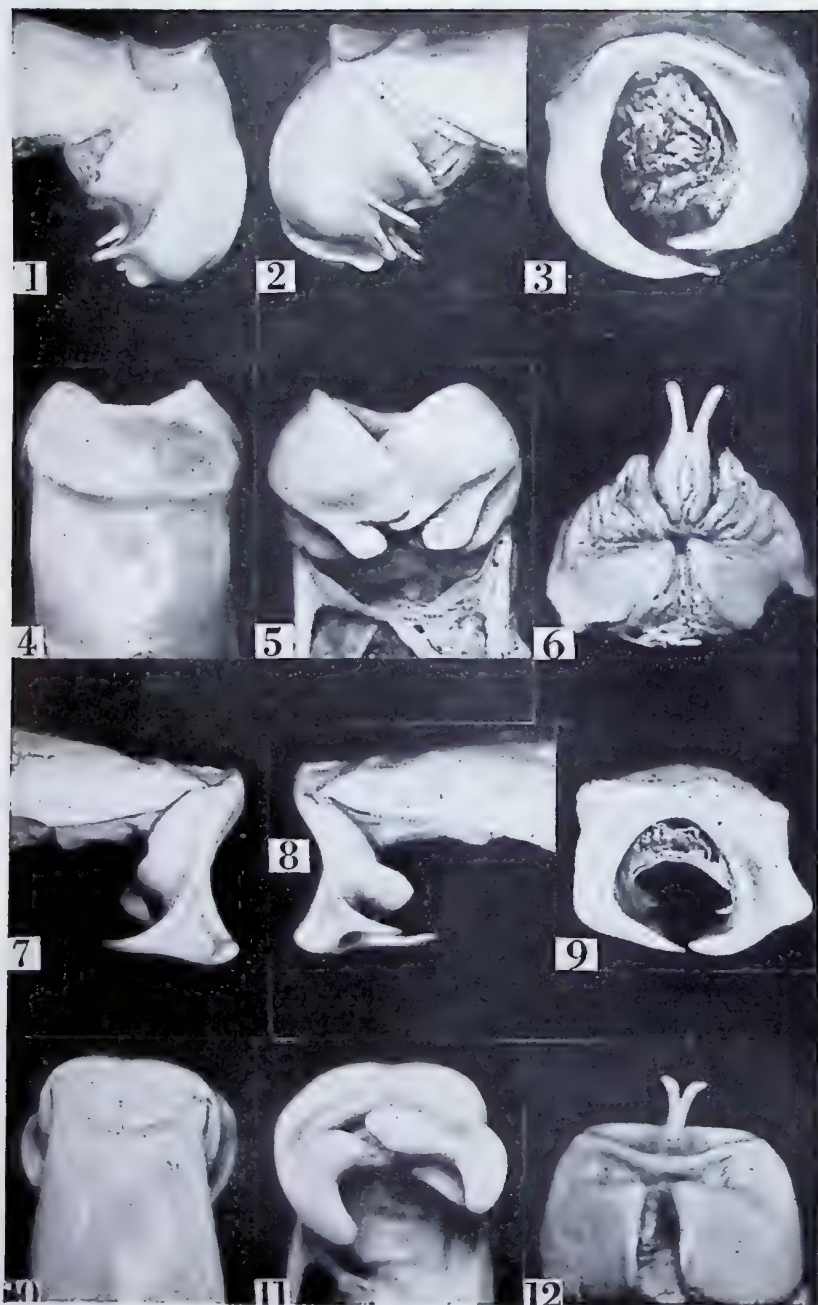
Genital aspects of *Phyllophaga* adults. *P. ephilida*, male: 1, Dorso-caudal; 2, right lateral; 3, ventral; female: 6, left lateral; 7, ventral. *P. ephilida* var. *virilis*, male: 4, Right lateral; 5, ventral. *P. ignava*, male: 8, Caudo-ventral; 9, right lateral. x 15.



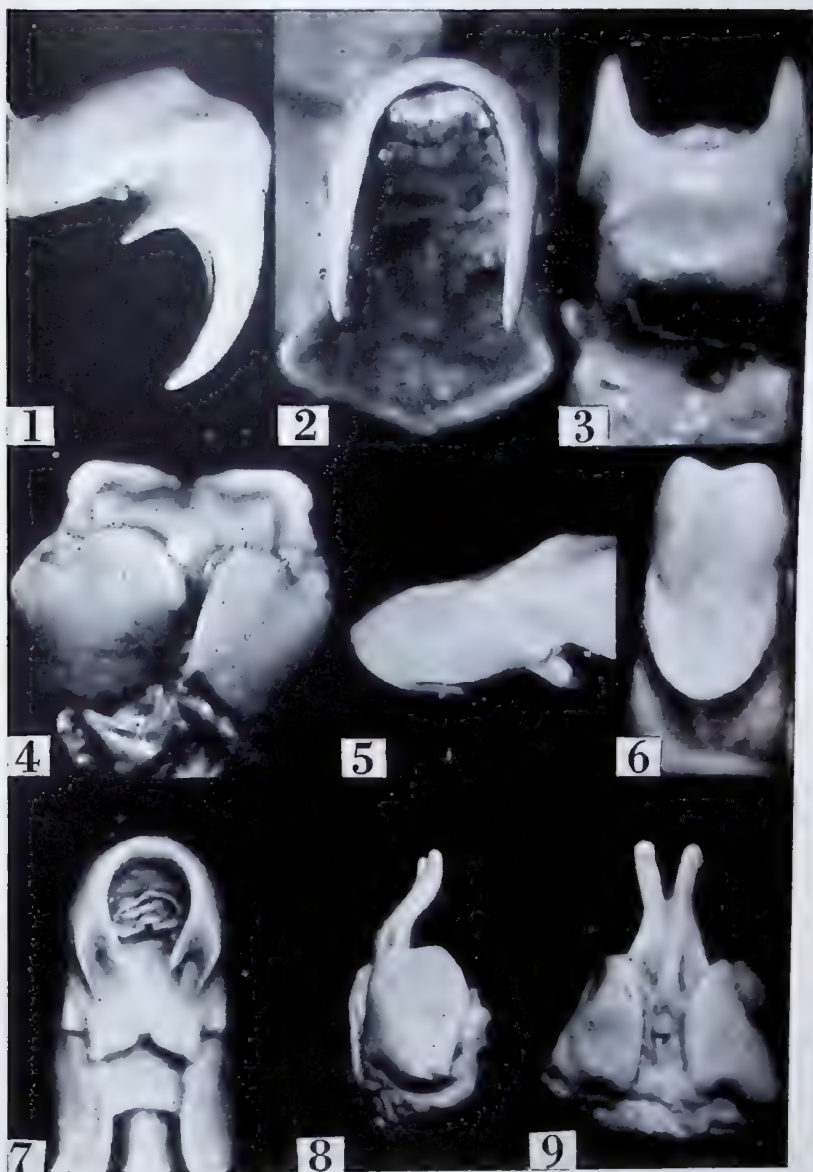
Genital aspects of *Phyllophaga* adults. *P. inversa*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, left lateral; 7, ventral. *P. congrua*, male: 8, Left lateral; 9, dorsal; 10, dorso-caudal; 11, ventral; female: 12, left lateral; 13, ventral. x 13.



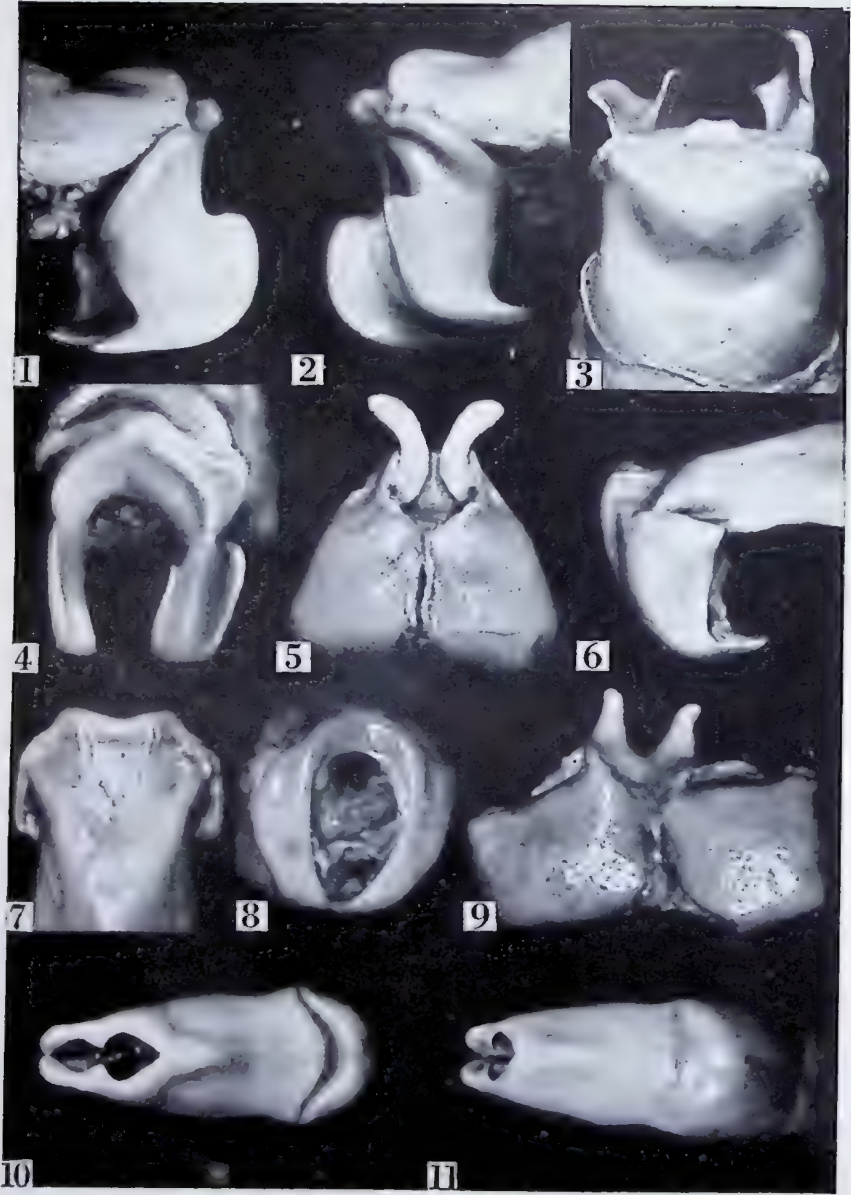
Genital aspects of *Phyllophaga* adults. *P. hirtiventris*, male: 1, Dorsal; 2, dorso-caudal; 3, right lateral; 4, ventral; female: 5, ventral. *P. glabricula*, male: 6, Left lateral; 7, dorsal; 8, right lateral; 9, dorso-caudal; 10, ventral; female: 11, ventral. *P. ignava*, female: 12, Ventral. x 13.



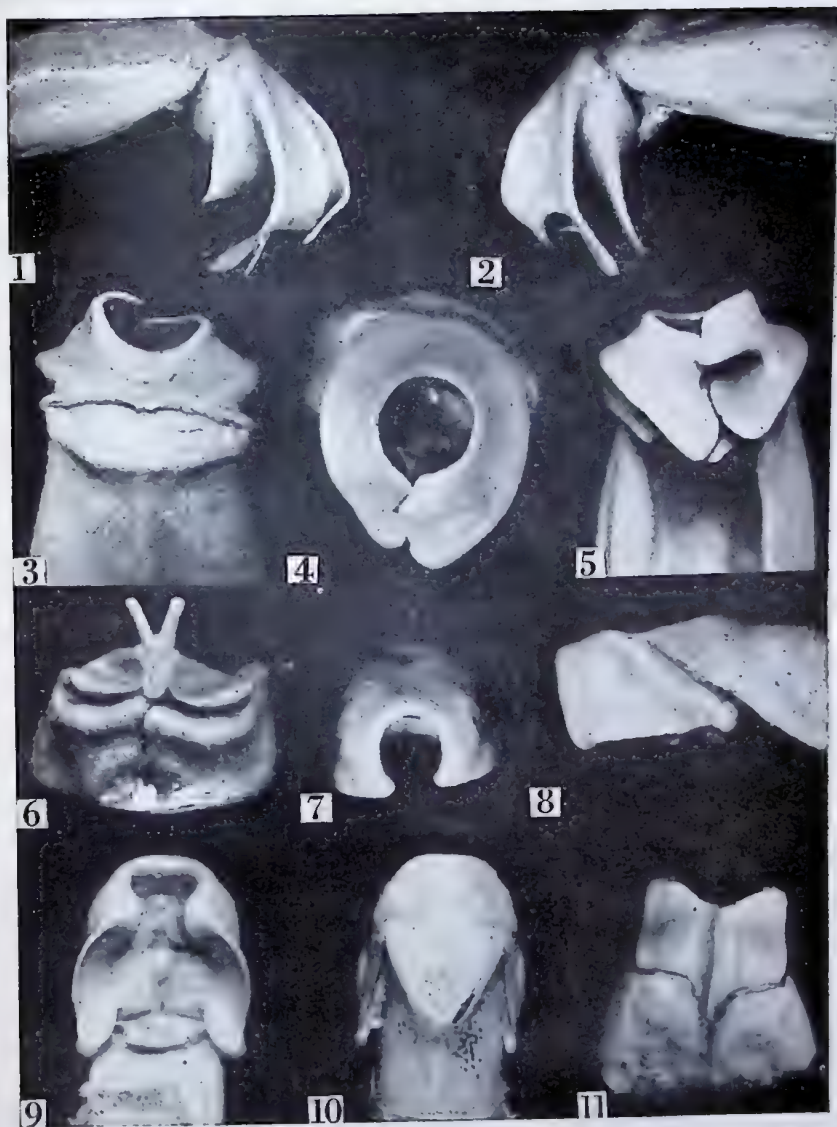
Genital aspects of *Phyllophaga* adults. *P. postrema*, male: 1, Left lateral; 2, right lateral; 3, dorso-caudal; 4, dorsal; 5, ventral; female: 6, ventral. *P. perlona*, male: 7, Left lateral; 8, right lateral; 9, caudal; 10, dorsal; 11, ventral; female: 12, ventral. x 10.



Genital aspects of *Phyllophaga* adults. *P. hamata*, male: 1, Left lateral; 2, caudal; 3, dorsal; female: 4, ventral. *P. aurea*, male: 5, Right lateral; 6, dorsal; 7, ventral; female: 8, right lateral, 9, ventral. x 20.



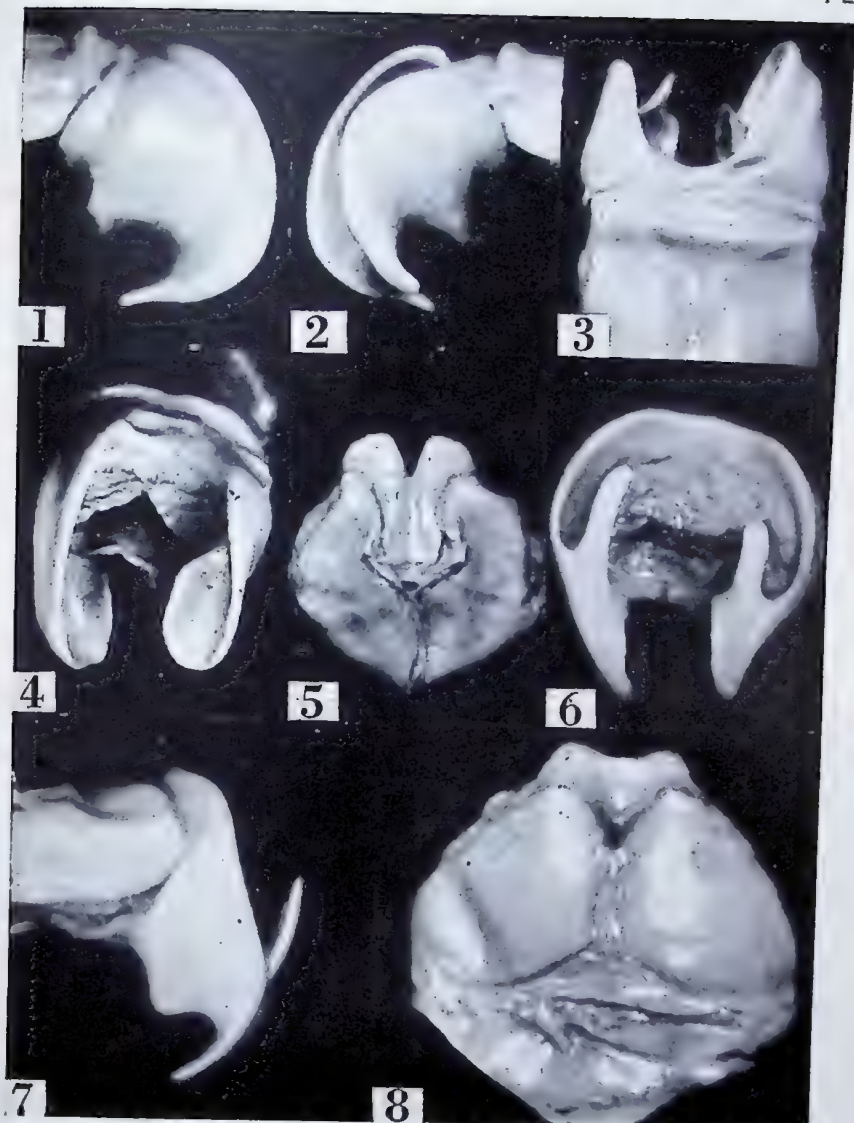
Genital aspects of *Phyllophaga* adults. *P. luctuosa*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, ventral. *P. pleroma*, male: 6, Right lateral; 7, dorsal; 8, caudal; female: 9, ventral. *P. ignava*, male: 10, Dorso-caudal; 11, dorsal. x 13.



Genital aspects of *Phyllophaga* adults. *P. vehemens*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, caudal; 5, ventral; female: 6, ventral. *P. fulvis*, male: 7, Dorso-caudal; 8, right lateral; 9, ventral; 10, dorsal; female: 11, ventral. x 13.



Genital aspects of *Phyllophaga* adults. *P. uniformis*, male: 1, Dorso-caudal; 2, right lateral; 3, dorsal; 4, ventral; female: 5, ventral. *P. calceata*, male: 6, Dorso-caudal; 7, right lateral; 8, ventral; 9, dorsal; female: 10, ventral; 11, left lateral. x 15.



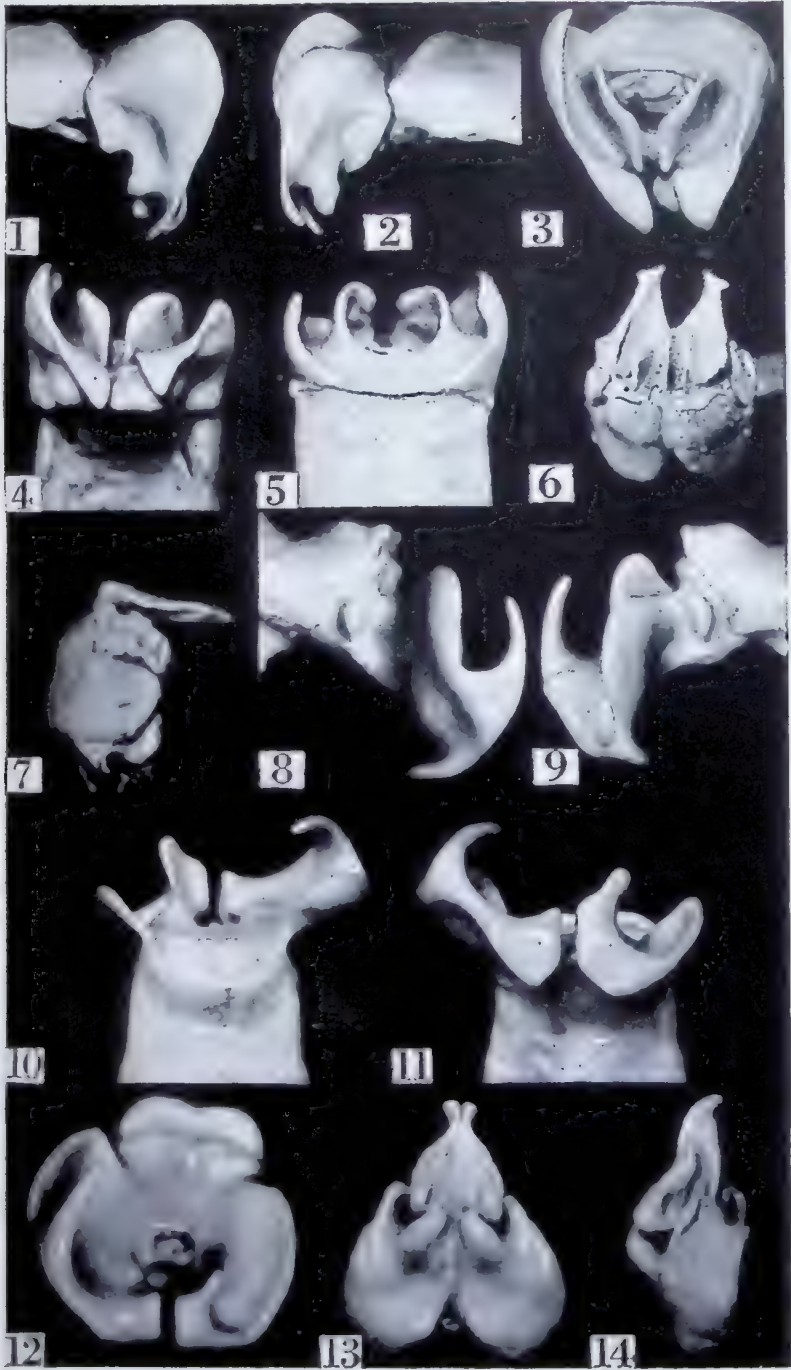
Genital aspects of *Phyllophaga* adults. *P. praetermissa*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, ventral. *P. schaefferi*, male: 6, Caudal; 7, left lateral; female: 8, ventral. x 20.



Genital aspects of *Phyllophaga* adults. *P. forbesi*, male: 1, Left lateral; 2, dorso-caudal; 3, dorsal; 4, ventral; female: 5, right lateral; 6, ventral. *P. fervida*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, caudal; 11, ventral; female: 12, ventral. x 13.



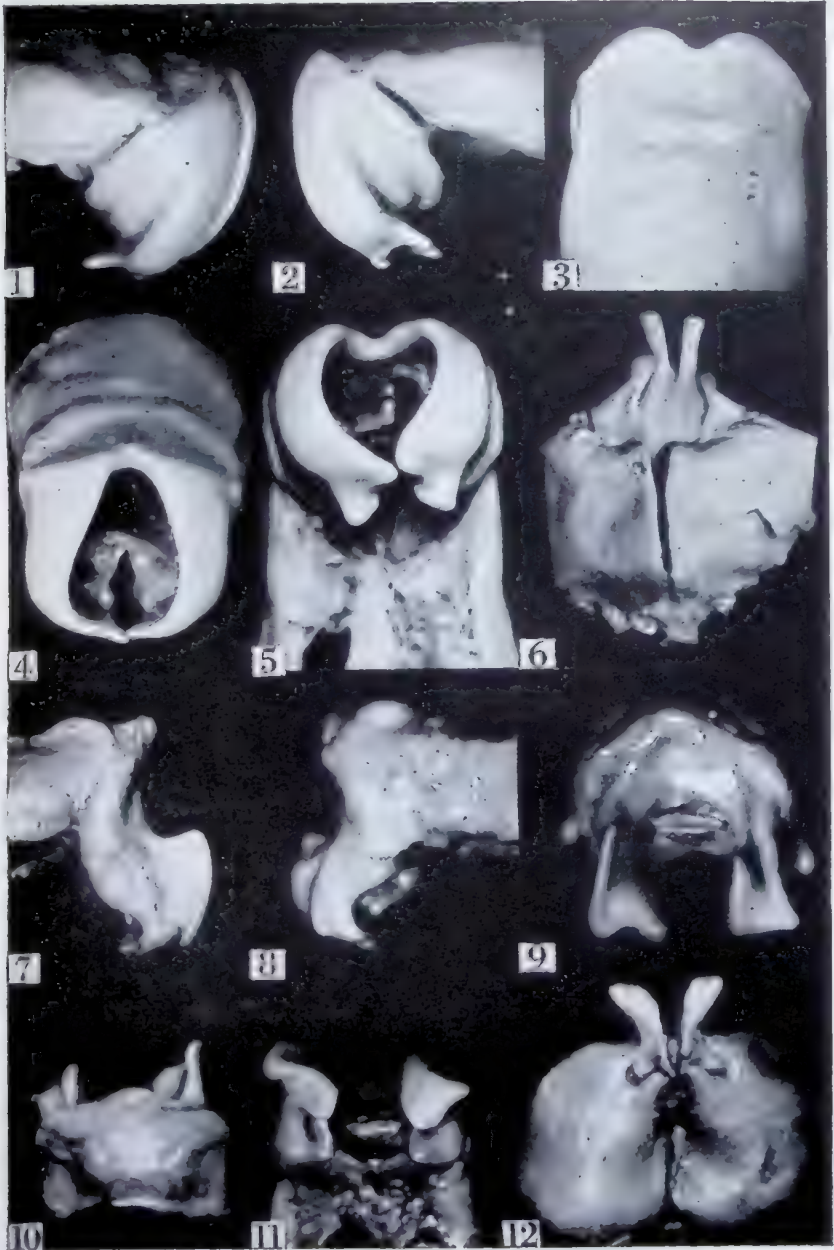
Genital aspects of *Phyllophaga* adults. *P. fusca*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. sylvatica*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; female: 11, right lateral; 12, ventral. x 13.



Genital aspects of *Phyllophaga* adults. *P. spreta*, male: 1, Left lateral; 2, right lateral; 3, caudal; 4, ventral; 5, dorsal; female: 6, ventral; 7, right lateral. *P. lodingi*, male: 8, Left lateral; 9, right lateral; 10, dorsal; 11, ventral; 12, caudal; female: 13, ventral; 14, right lateral. x 10.



Genital aspects of *Phyllophaga* adults. *P. corrosa*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, ventral. *P. bipartita*, male: 6, Left lateral; 7, right lateral; 8, dorso-caudal; 9, dorsal; 10, ventral; female: 11, left lateral; 12, ventral. x 13.



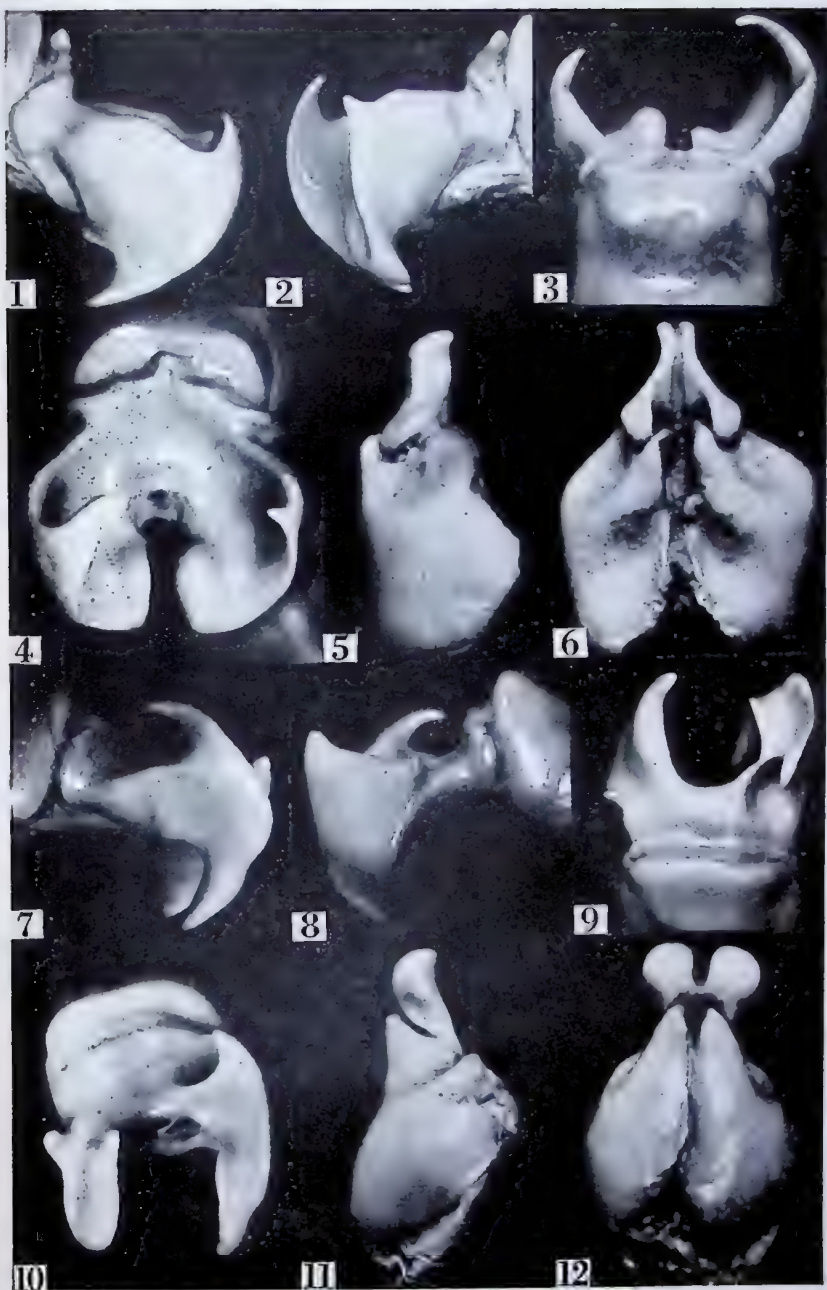
Genital aspects of *Phyllophaga* adults. *P. ulkei*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. sodalis*, male: 7, Left lateral; 8, right lateral; 9, dorso-caudal; 10, dorsal; 11, ventral; female: 12, ventral. x 13.



Genital aspects of *Phyllophaga* adults. *P. gracilis*, male: 1, Dorso-caudal; 2, right lateral; 3, ventral; female: 7, ventral. *P. gracilis* var. *angulata*, male: 4, Dorso-caudal; 5, right lateral; 6, ventral. *P. inopia*, male: 8, Right lateral; 9, dorso-caudal; 10, dorsal; 11, ventral; female: 12, ventral. x 20.



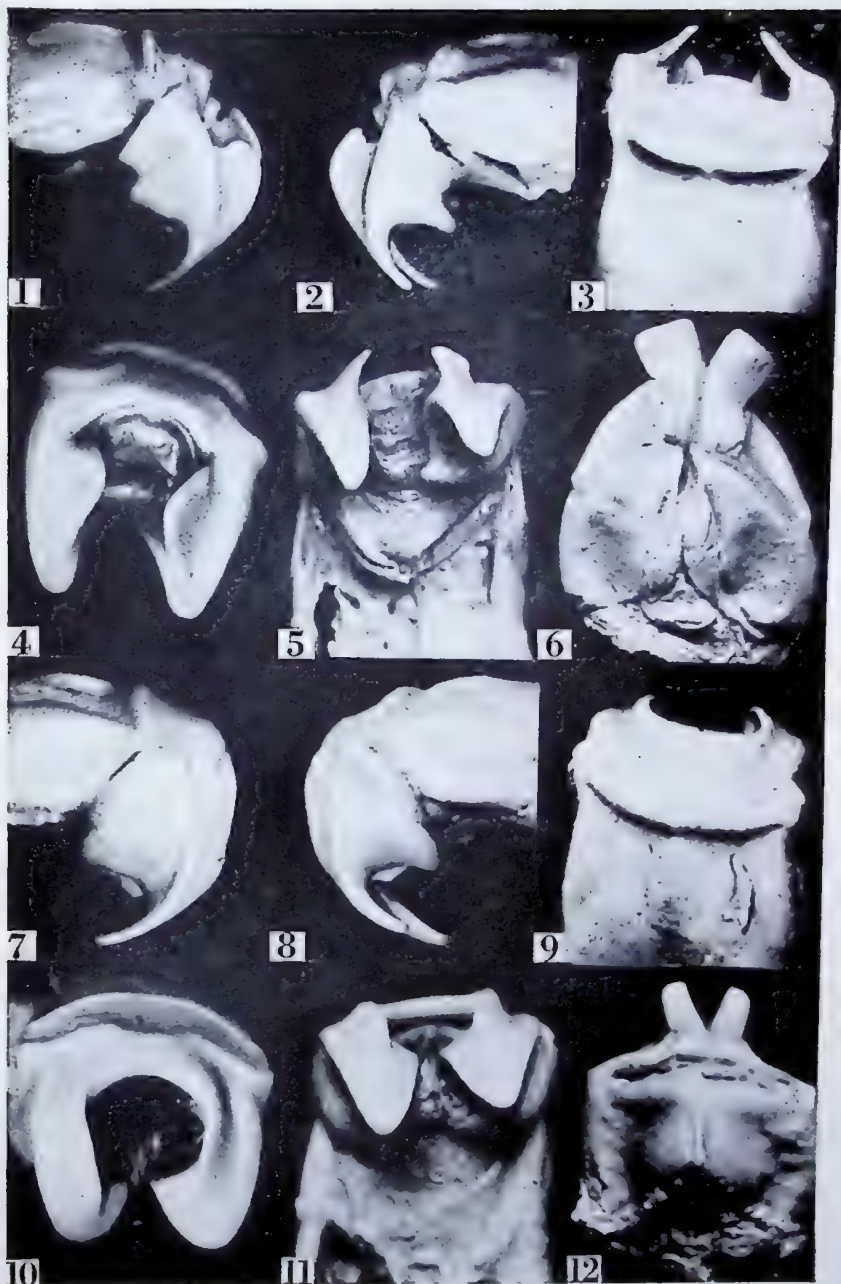
Genital aspects of *Phyllophaga* adults. *P. latidens*, male: 1, Caudal; 2, ventral; 3, right lateral; female: 4, ventral; *P. glaberrima*, male: 5, Dorso-caudal; 6, right lateral; 7, caudo-ventral; 8, dorsal; female: 9, ventral. x 20.



Genital aspects of *Phyllophaga* adults. *P. incuria*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, right lateral; 6, ventral. *P. infidelis*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; female: 11, right lateral; 12, ventral. x 13.



Genital aspects of *Phyllophaga* adults. *P. foxii*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, ventral; 5, dorso-caudal; female: 6, right lateral; 7, ventral. *P. ovalis*, male: 8, Left lateral; 9, right lateral; 10, dorsal; 11, ventral; 12, dorso-caudal. x 13.



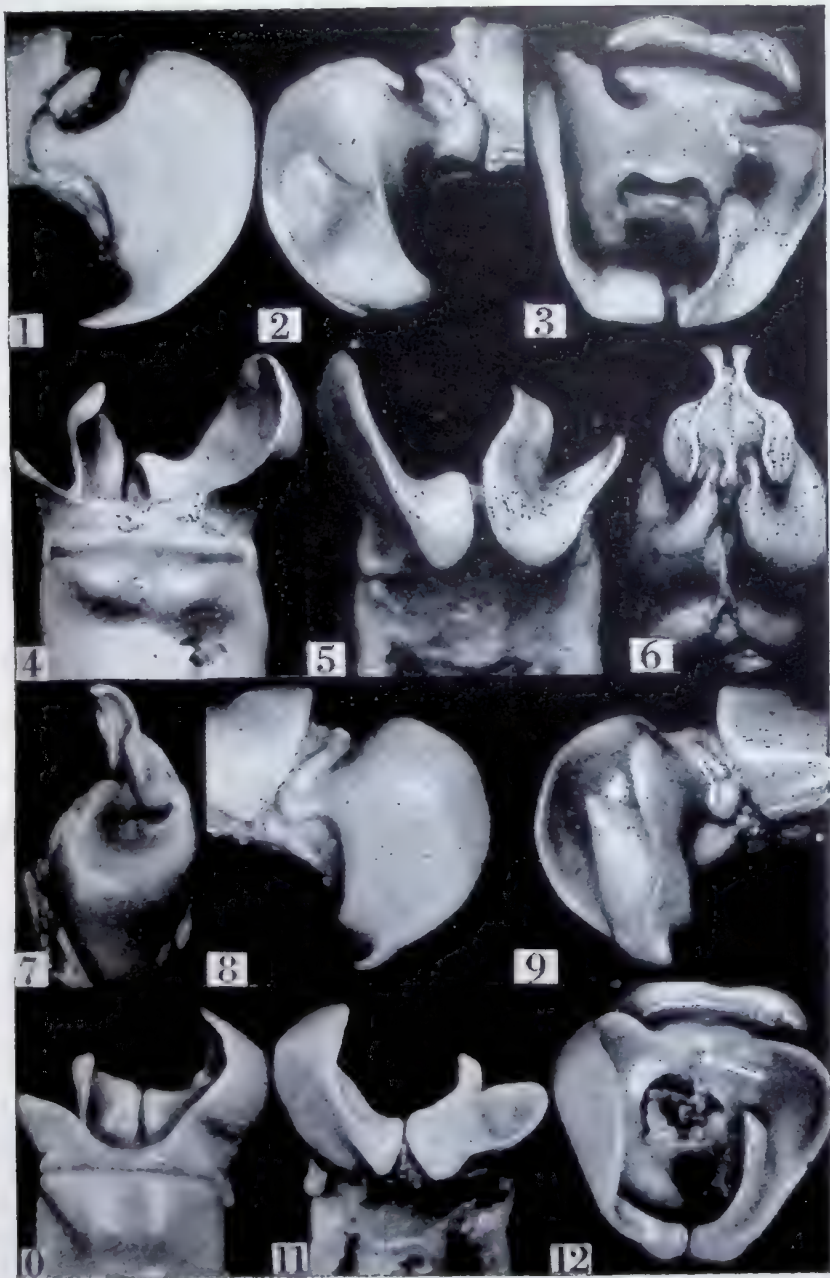
Genital aspects of *Phyllophaga* adults. *P. anxia* (Northern form), male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. anxia* (Southern form), male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; 11, ventral; female: 12, ventral. $\times 13$.



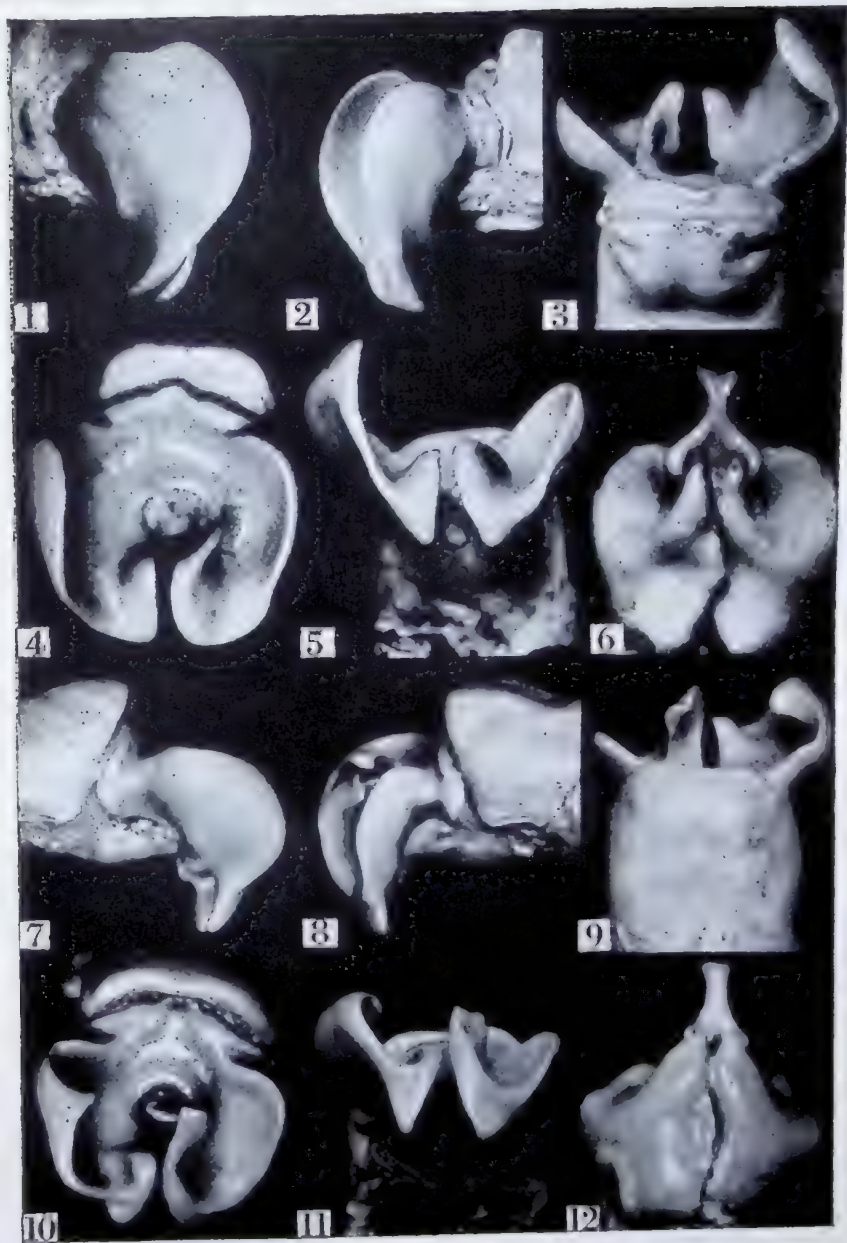
Genital aspects of *Phyllophaga* adults. *P. hornii*, male: 1, Left lateral; 2, right lateral; 3, dorso-caudal; 4, dorsal; 5, ventral; female: 6, ventral; 7, right lateral. *P. fraterna* var. *mississippiensis*, male: 8, Left lateral; 9, right lateral; 10, dorsal; 11, ventral; female: 12, ventral. x 10.



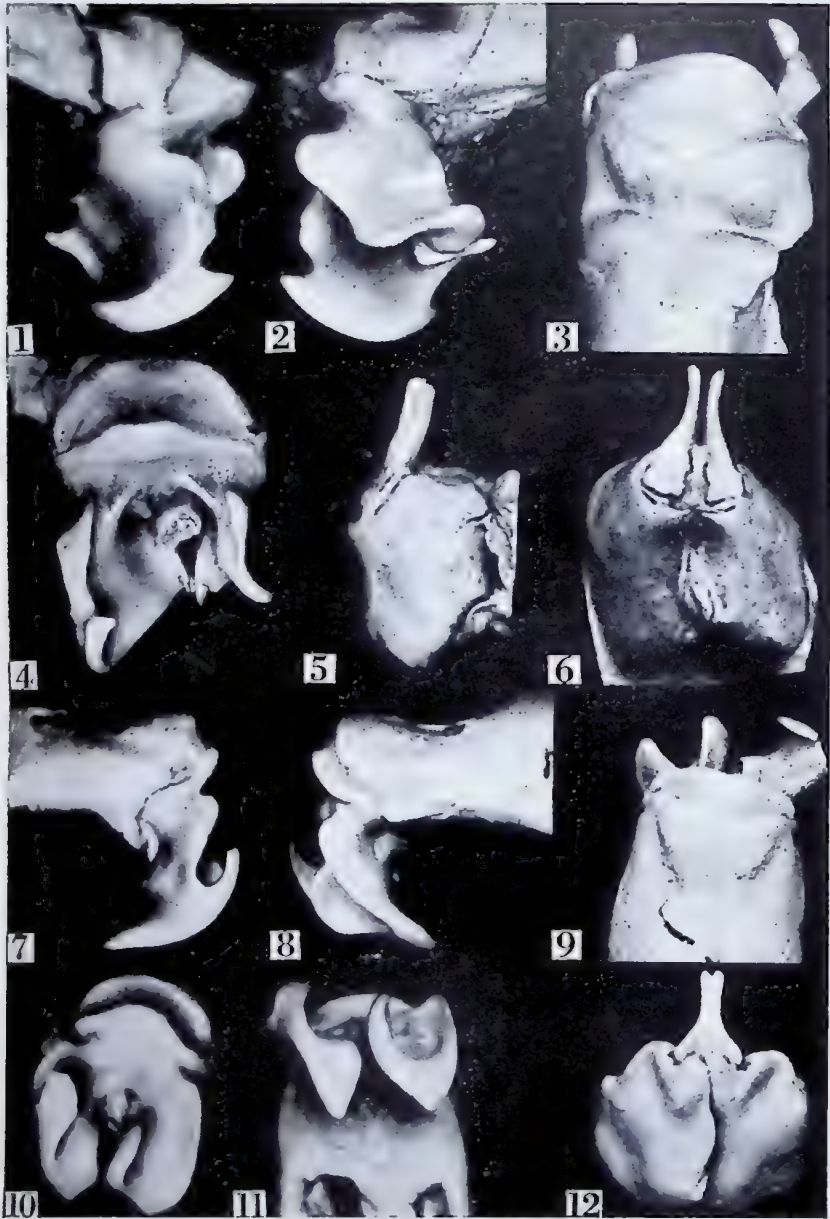
Genital aspects of *Phyllophaga* adults. *P. profunda*, male: 1, Left lateral; 2, right lateral; 3, dorso-caudal; 4, dorsal; female: 5, ventral. *P. rugosa*, male: 6, Left lateral; 7, right lateral; 8, ventral; 9, dorsal; 10, dorso-caudal; female: 11, ventral; 12, left lateral. x 10.



Genital aspects of *Phyllophaga* adults. *P. knochii*, male: 1, Left lateral 2, right lateral; 3, dorso-caudal; 4, dorsal; 5, ventral; female: 6, ventral; 7, left lateral. *P. pearliae*, male: 8, Left lateral; 9, right lateral; 10, dorsal; 11, ventral; 12, dorso-caudal. x 10.



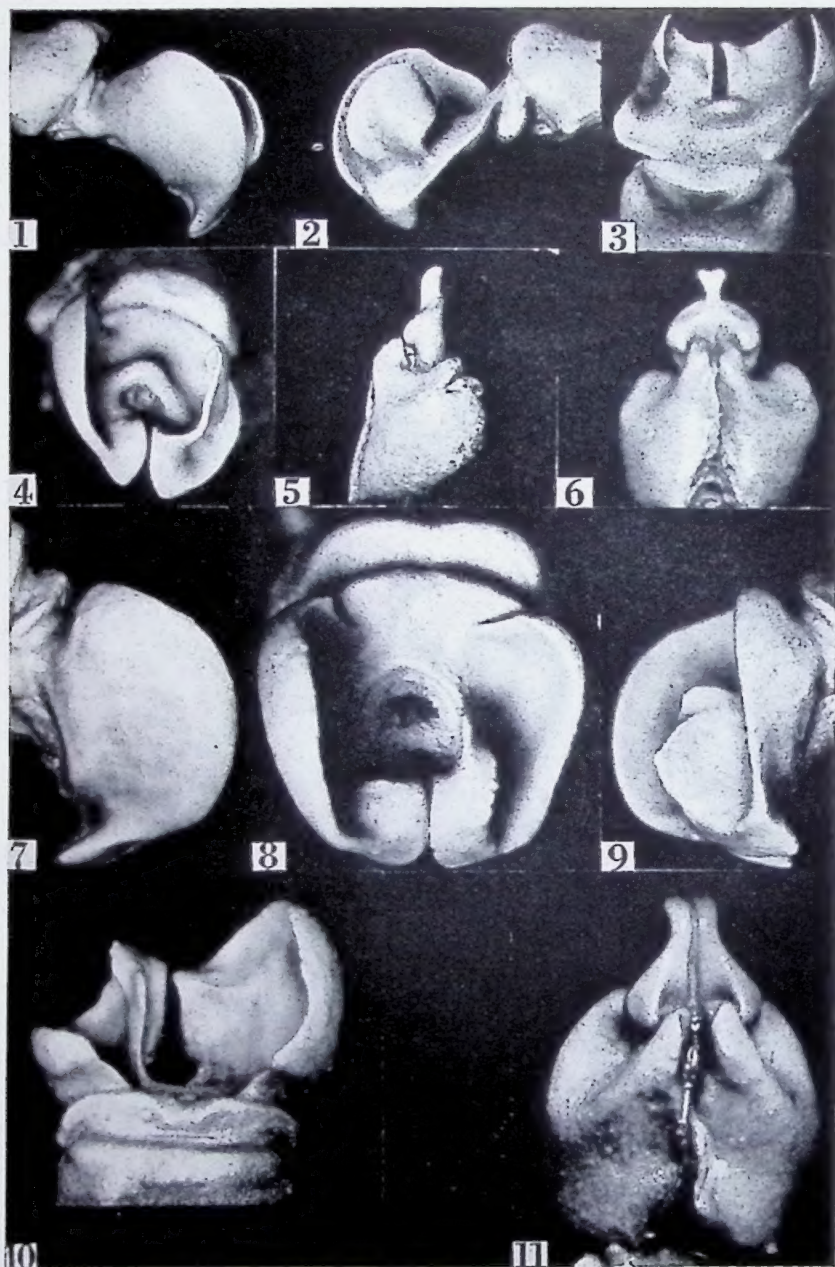
Genital aspects of *Phyllophaga* adults. *P. fraterna*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, ventral; female: 6, ventral. *P. kentuckiana*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; 11, ventral, female: 12, ventral. x 13.



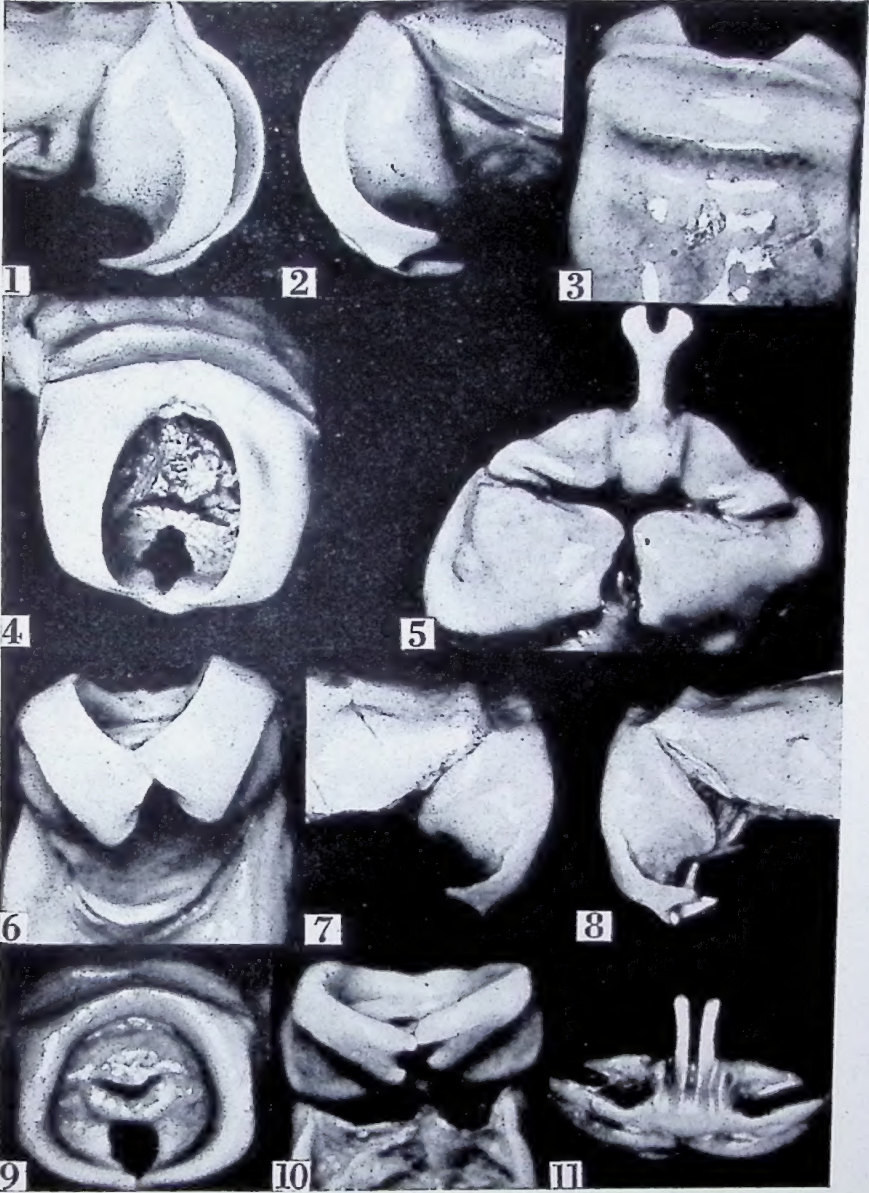
Genital aspects of *Phyllophaga* adults. *P. scitula*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 5, right lateral; 6, ventral. *P. forsteri*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; 11, ventral; female: 12, ventral. x 13.



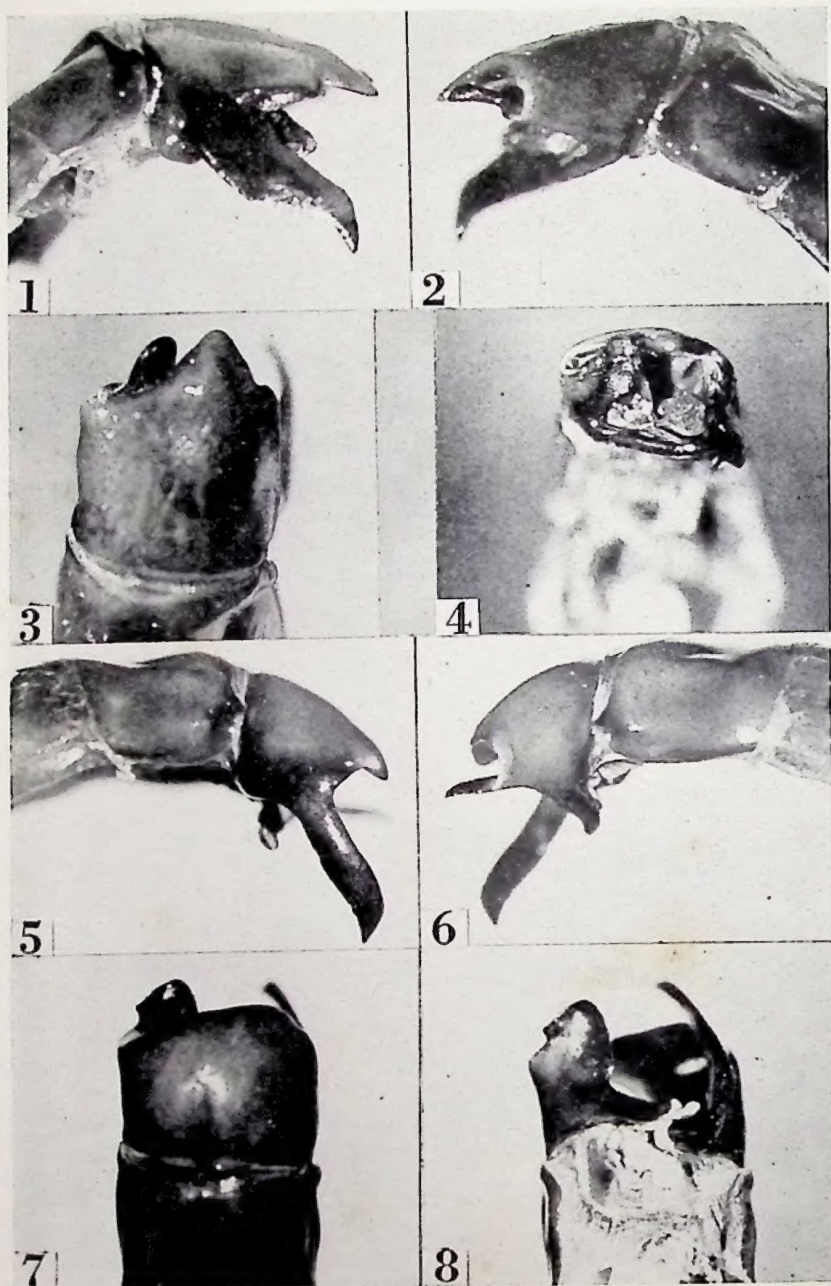
Genital aspects of *Phyllophaga* adults. *P. tecta*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal female: 5, right lateral; 6, ventral. *P. marginalis*, male: 7, Left lateral; 8, right lateral; 9, dorsal; 10, dorso-caudal; 11, ventral; female: 12, ventral. x 13.



Genital aspects of *Phyllopaga* adults. *P. floridana*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; female: 5, right lateral; 6, ventral. *P. curialis*, male: 7, Left lateral; 8, dorso-caudal; 9, right lateral; 10, dorsal; female: 11, ventral. $\times 13$.



Genital aspects of *Phyllophaga* adults. *P. drakii*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, dorso-caudal; 6, ventral; female: 5, ventral. *P. Karlsioei*, male: 7, Left lateral; 8, right lateral; 9, dorso-caudal; 10, ventral; female: 11, caudo-ventral. x 13.



Genital aspects of *Phyllophaga* adults *P. reevesi*, male: 1, Left lateral; 2, right lateral; 3, dorsal; 4, ventral. *P. xerophila*, male: 5, Left lateral, 6, right lateral; 7, dorsal; 8, ventral. x 20.

